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CANCER

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CANCER

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CANCER

How it is Caused; How it can be Prevented

BY
J. ELLIS BARKER

With an Introduction
BY
SIR W. ARBUTHNOT LANE,
BART., C.B., M.S., F.R.C.S., ETC.
CONSULTING SURGEON AT GUY'S HOSPITAL, LONDON

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TO

ALL THOSE MEN AND WOMEN
WHO DO NOT WISH TO DIE OF CANCER
THIS BOOK IS DEDICATED

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AUTHOR'S PREFACE

"Progress in medicine can only be made by acquiring the knowledge of the causation of disease."—Sir W. Arbuthnot Lane, *Reflections on the Evolution of Disease.*

"The essence of immunity lies in the living elements of the body."—Elie Metchnikoff, *The New Hygiene.*

"Only Nature can repair the machines which Nature has made."—Sir Arthur Keith, *The Engines of the Human Body.*

It is very daring for an outsider to write a book on a highly technical, much-discussed, and obscure subject, such as the causation and the prevention of cancer. It is doubly daring for one who is not a medical man to criticize and to try to disprove the views which are very generally held among professionals and to put forward a doctrine of his own. I have written this book with the utmost diffidence, and I think I owe to my readers a brief explanation of the circumstances which led to the writing of this volume.

I had lost a great number of relatives and friends through cancer. Being of an enquiring disposition, I began to study the subject. I have an inherited interest, and possibly an inherited aptitude, for medical matters. My father was an eminent physician. He was a friend and collaborator of Billroth

and Virchow. I thought that the cause of cancer might be found in a direction which had been somewhat overlooked. I put my views before highly experienced friends. They encouraged me greatly and supported me to the best of their ability. Had it not been for their help, this book would scarcely have been written.

Among those who have given me invaluable assistance are Sir W. Arbuthnot Lane, Bart.; Sir George Newman, the chief medical officer of the Ministry of Health, who permitted me to draw freely on the resources of his great organization; Dr. Major Greenwood, the eminent medical statistician of the Ministry of Health; Dr. F. L. Hoffman, the great American statistician, who has devoted many years to the statistical study of cancer and who has written a most admirable book, *The Mortality from Cancer throughout the World,* and pamphlets and articles without number dealing with the same subject; Dr. Nathan Mutch, the well-known physician; Colonel Robert McCarrison, the eminent investigator; Dr. A. White Robertson, the great authority on blood and electro-pathology; and many other prominent physicians, surgeons, chemists, statisticians, librarians, etc. I had very interesting conversations on cancer with Sir Havelock Charles; Mr. J. Lockhart Mummery, the chairman of the British Empire Cancer Campaign; with Dr. L. J. Llewellyn, and a great many others. Sir Arbuthnot Lane undertook the very arduous labour of reading through and criticizing first the entire manuscript and then the typescript, chapter by chapter, before it was sent to the

printers, and Sir D'Arcy Power, the consulting surgeon at St. Bartholomew's Hospital, had the very great kindness of reading and correcting the proof. I have been fortunate in receiving a very strong professional backing.

As a rule, amateurs writing on a difficult technical subject lack the necessary knowledge. They are apt to become victims of an immature idea, of a fleeting impression, of an illusion, of their own enthusiasm. Hence they often endeavour to strengthen their case by sweeping assertions, by eloquence, by declamation, instead of relying on facts. I did not mean to fall into this error. In order to test the soundness of my theory, I laboriously went through the vast literature bearing on cancer and many allied matters published in England, in America, on the Continent, in Japan, and elsewhere, and accumulated an enormous number of facts supporting every point of my argument. Every statement of mine is borne out by an overwhelming mass of evidence.

Most authors support their assertions only by a few examples which might possibly be exceptions proving the rule. In order to show that those statements of mine which may seem very questionable are indeed correct and reliable, I have, as a rule, quoted twenty, thirty, or more authorities or examples in support of my contention. That method will seem tedious to some, but it has the advantage that the reader must feel that he can rely on the statements made by me even if they are quite unorthodox and may seem wildly incredible.

I would have liked to have extended my investiga-

tion in various directions and to have brought still further proofs. However, I have not done so. I have rushed out the book with the utmost speed, believing that every delay will cause the unnecessary loss of many lives.

Some years ago I was, I think, in an advanced pre-cancerous condition. To improve my health, I took energetic measures which proved very beneficial. Whether I succeeded in staving off cancer only the future can show. At any rate, I have given an account of my experiences in one of the concluding chapters. Possibly some of my readers may benefit by it.

As this book is addressed principally to the general public, it is written in plain and quite untechnical language. Hence it can easily be read by the uninitiated. Although this work is meant to be popular, scientists, doctors, and surgeons interested in cancer may find in this book much that will be of interest and of value to them. I believe that in no other work existing is there to be found a similar collection of facts bearing on the cancer problem. Hundreds of books and other publications have been drawn upon, as reference to the bibliography at the end of the volume will show. In order to make reading easy, there are no footnotes. However, the quotations given can easily be verified from the titles and page numbers given in the text.

This book is not merely a summary of the cancer literature of the world and a collection of extracts. It would not have been worth while to repeat what other people have stated. I should never have writ-

ten this book had my studies not confirmed my conviction that cancer is preventable, that it is possible to reduce the mortality from that disease to very small proportions, or to eliminate it completely. I shall endeavour in the succeeding pages to show the various and largely unsuspected causes which induce this extraordinary disease. The laying bare of these causes will indicate the way towards the limitation, if not the complete elimination, of this scourge.

I trust that my readers will have the patience to follow my line of argument throughout the book. As I stated before, I undertook this work with great diffidence. Notwithstanding the splendid support and encouragement which I have received from many quarters, I might have abandoned the task—book-writing is laborious and unprofitable, and those who challenge accepted opinions are not popular—had I not been impelled by a sense of duty, by the wish of seeing mankind freed from a most horrible disease which apparently can be prevented.

Many writers treat cancer and sarcoma as if the two were identical. In the official statistics cancer and sarcoma are unfortunately lumped together under the heading of "Malignant Disease" or of "Cancer." I consider sarcoma totally different from cancer. My views relating to causation and prevention apply to cancer, and to cancer only. I have not endeavoured to disentangle the official statistics which confuse the two. Otherwise I would have bewildered my readers. However, the statistics given are not greatly affected, inasmuch as sarcoma is comparatively rare among civilized peoples. Na-

tives who do not suffer from cancer often have sarcoma. Similarly, children of civilized nations have often sarcoma, but rarely cancer.

J. ELLIS BARKER.

Albion Lodge,
Fortis Green,
East Finchley, N.2.
February, 1924.

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INTRODUCTION

BY

SIR W. ARBUTHNOT LANE,
BART., M.S., F.R.C.S., ETC.
CONSULTING SURGEON TO GUY'S HOSPITAL

Some time ago, Mr. Ellis Barker told me that he had written a book, *Cancer: How it is Caused, How it can be Prevented,* and asked me to read through the manuscript. I have done so with the greatest interest and the keenest pleasure, and the further I proceeded, the better I liked the book. His work is most excellent and most valuable, and I am certain that it will prove a great boon to mankind.

Mr. Barker possesses an extraordinarily vast knowledge of the subject treated, a knowledge most remarkable in a layman. He shows in the most convincing manner how cancer is brought about and how it can be staved off.

Not unnaturally, I looked at his work with misgivings, knowing that he possessed no practical medical experience. However, I have come to the conclusion that he has produced a truly scientific work, a work which is unique of its kind, of which any scientist might be proud. Perhaps it is an advantage that Mr. Barker is not a member of our profession. Medical training might have deprived him of that clarity of view and of that independence

of opinion which he possesses to such a remarkable degree.

The author, not being a medical man, has had the good sense to write his book in the plainest and the most untechnical language, so as to make it understandable to all. After all, the scientific value of a book is not increased by the use of long words derived from Greek and Latin. I have made no alteration whatever in the simple language employed, a language which the great public will understand and which is bound to carry conviction, especially as the proofs adduced by the author are overwhelmingly strong.

I have been greatly impressed by the vast erudition possessed by the writer. Although the book is primarily written for the general public, it should prove of the greatest interest and value to all medical men, and I feel sure that it will be widely read by them. We have not paid sufficient attention to the prevention of cancer. Mr. Barker's book will open new vistas to many of us. Besides, his book is a veritable storehouse of information. I know of nothing similar in medical literature, and I should not be surprised at all if professional and non-professional opinion would declare Mr. Barker's book to be easily the most important practical work on cancer existing in English or in any other language.

The medical profession, especially in America, has endeavoured to fight cancer by making its symptoms known to all, by broadcasting the early manifestations of the disease in the various parts of the body, and by urging sufferers to submit to operation with-

out a moment's delay. Mr. Ellis Barker has taken a much better grip upon the cancer problem. He rightly considers prevention infinitely more important than cure. After all, prevention of cancer is the only certain remedy we have, while the cure of cancer by operation or otherwise is, to say the least, very problematical, very speculative, and only too often very disappointing.

The author has demonstrated the cause of cancer so clearly and so convincingly that any child will understand him. The discovery of the cause indicates the way by which we may avoid the disease and eliminate it altogether. Only by prevention can we reduce, and eventually abolish, the holocaust of unspeakable suffering and martyrdom and death which at present afflicts mankind. Only by prevention can we overcome the most terrible of all scourges. The great body of the intelligent lay public will, I hope, become convinced that cancer is preventable by the overwhelming proof which is to be found in this excellent work, and will insist on the inauguration of the necessary measures which will check the disease.

We medical men can do comparatively little in the fight against cancer. We are too busy with the tasks of the day. Great reforms require national action. Public opinion must be mobilized and must insist on the reforms which the author has proposed.

I imagine that Mr. Barker asked me to read his manuscript because he had drawn largely upon my own writings. That fact inclined me at first to refuse his request. However, on consideration, I rec-

ognized that his work is of the very greatest importance, and that it may prove a most potent instrument in fighting that plague and relieving the sufferings of humanity. That idea removed all scruples and all hesitation on my part and caused me to help him with all my strength, regardless of the time and labour involved.

I trust that the information contained in this book will get into the hands of every intelligent and thoughtful member of the community, and that Mr. Ellis Barker will receive the recognition which his energy and philanthropy so thoroughly deserve. The story of cancer is a ghastly one. The disease has spread, and is still spreading, like wildfire through all civilized nations, and the sufferings caused by it give a shudder of horror even to us medical men who have become hardened by the constant sight of human suffering.

Hitherto we have tried to fight cancer only when the disease had been established. Unfortunately, the surgeon usually comes too late upon the scene. That is inevitable in view of the insidious nature of the disease, for its presence is discovered as a rule only when it is too late.

It is doubtful whether a cure for cancer will ever be found. It is true numerous able researchers are assiduously trying to find a micro-organism responsible for the disease. However, even if they should succeed in finding such a micro-organism, we may no more be able to eradicate cancer from the system than we can eradicate the bacillus of tubercle. By no known means can we *cure* any chronic disease.

Therefore prevention is infinitely more important than cure.

The author has conclusively and convincingly shown how cancer is caused and how it can be prevented. I hope and trust that the publication of his book will mark a new era in the fight against cancer. I hope and trust that this book will stimulate the public into activity and will cause men and women of all ranks to study the methods by which this disease can be prevented. Moreover, I hope and trust that large-hearted philanthropic men will form societies for the prevention of cancer, societies which aim at carrying out the reforms proposed in this volume. By the means indicated by the author, it should be possible to reduce the cancer mortality very greatly, and to convert cancer from being one of the most frequent into one of the rarest diseases.

The adoption of the reforms advocated by Mr. Barker will not only prevent cancer. The reforms suggested will also reduce the mortality from the various diseases which are intimately connected with cancer and which spring from the same causes as cancer.

Mr. Barker demonstrates in the clearest manner possible and with an overwhelming material supporting his contention that cancer is a disease of civilization, that it is unknown, or almost unknown, among primitive peoples who lead a primitive life. By careful and painstaking analysis, he points out to us those factors in civilized life in which the causation of cancer and of many other diseases is to be found. His chapters on food and feeding are most

instructive and useful, and they should appeal to every reader.

I feel that this book will bring a new hope and a new happiness to humanity, and that it will dispel the depression and the despair which have settled upon millions of people who are haunted by the fear of being slowly tormented to death by a disease which is the despair, not only of the suffers, but also of the medical men and of the scientists who at present are practically helpless. Mr. Barker has shown us the way how to conquer cancer. Let us listen attentively to what he has to say, and let us support him with the utmost energy and enthusiasm. Thus we shall stay the plague which at present is desolating the world.

CANCER

CANCER

CHAPTER I

The Horror and the Mystery of Cancer

Among the important diseases which torment mankind, cancer is undoubtedly by far the worst. It inflicts unspeakable agonies upon the poor sufferers, and frequently cancer patients become horrible to their own families by the intolerable smells which emanate from them. Consumptives are frequently cheerful to the end. People suffering from pulmonary tuberculosis are apt to order new clothes and to make plans of travel during the last days of their lives, but most cancer sufferers are deeply depressed and despondent from the beginning of their disease, possibly owing to the blood-poisoning which accompanies it.

One of the worst aspects of cancer is its insidiousness. As a rule, a cancerous growth is at first painless. If it occurs inside the body—and most cancers occur in our insides—it is given a chance of growing and spreading for some considerable time without being discovered. Only when a large-sized tumour has developed which presses upon some tender spot,

such as a nerve, a bowel, etc., does the afflicted person become aware that there is something wrong. Then, as a rule, it is too late for a successful operation. The sufferer is doomed. The great majority of cancers occur out of sight in the stomach, the abdomen, etc., as a full table given at the beginning of the seventh chapter will show.

Nearly every one is familiar with instances when the existence of an internal cancer was discovered only when it was too late. A great friend of mine, the late Earl Grey, was unwell for a couple of years and was losing weight. His doctors treated him for indigestion, for a nervous breakdown, etc., and suggested a sea voyage. Serious developments caused them to make an exploratory operation, which disclosed a large and inoperable cancer of the liver, the growth of years, which caused his death. Another friend of mine, a lady, who frequently went to the doctor, was losing weight, but did not trouble about it as she felt quite well. One day her bowels failed to act. As ordinary remedies failed, the doctor, suspecting an obstruction, opened her up and found a cancer, the growth of three or four years, which proved fatal.

An enormous number of women suffer from cancer of the breast. In women with a very full breast, a cancerous growth, which usually occurs at a considerable distance from the surface, it not readily discovered. Hence it may stealthily grow and spread during many months. A woman who becomes aware of a lump in the breast is apt not to attach much importance to it if it is painless. Unfortu-

nately, breast cancer is always painless at the beginning. Besides, it is very difficult for the most experienced doctor to make out whether a vague lump in the breast is malignant or non-malignant. There is a natural aversion among women to undergo an operation which may possibly be unnecessary but which certainly is disfiguring. Hence women die by the thousand every year from cancer of the breast.

In a long article entitled "The Clinical Diagnosis of Carcinoma of the Breast," which appeared in the *Lancet* of the 5th of January, 1924, Mr. William H. Battle, Consulting Surgeon to St. Thomas's Hospital, wrote:—

"The importance of the early recognition of a 'carcinoma' which has arisen in any part of the body is fully appreciated by the medical profession, as the possibility of successful treatment depends so greatly on the stage at which operation is permitted. At the present time we know of no other method of interference which affords a chance of cure. It might be considered that in an organ which is situated as the breast it would be quite easy to distinguish a malignant from a simple growth, but this is not so in the early stages, especially when the patient is well nourished. . . .

"There is no pain in the early stage, when changes in the breast are but slightly marked, and require an expert to interpret them. To this statement there are few exceptions. The majority of patients present themselves when the nature of the disease is evident and the probability of successful treatment by any method doubtful. A series of photographs which have been taken of cases when they first came under observation proves this very decisively.

"From year to year it has been the same experience in hospital work—few have come unless there has been a change of marked character in the nipple or in the skin

over the breast, or unless a pain has become so insistent that it can no longer be tolerated. In most of these advanced cases there was no loss of flesh, and the general appearance of the patients was unaltered.

"A small proportion say that they did consult someone when they first felt a lump in the breast, but that they were reassured as to its nature—as it was small, discovered by accident when washing, and did not cause pain, they were told not to trouble any more about it. They were quite satisfied to follow this advice until they noticed an alteration in the appearance of the breast or pain supervened. The opportunity of giving permanent relief may then have passed for ever. Most of us have made mistakes in the diagnosis of carcinoma of the breast in its early stage. Possibly a first opinion was given after insufficient examination, but whatever the reason of the wrong diagnosis, what a tragedy was staged for a later appearance."

The cancer most easily discovered is that of the skin and of the tongue. Skin cancer is rather rare, but cancer of the tongue is fairly frequent. Early operation is possible, but unfortunately tongue cancer, the most easily discovered cancer of all because of the discomfort which it creates, is particularly deadly. It spreads with extraordinary rapidity. However, even sufferers from cancer of the tongue are apt to delay because they are, not infrequently, syphilitic persons who have suffered previously from tongue affections. Hence they often believe that the little initial growth is nothing serious, especially as it causes discomfort but not pain. Dr. Francis Carter Wood, the Director of the Institute of Cancer Research, Columbia University, stated in the English edition of *The World's Work* in July, 1923:—

"Another disturbing fact, not fully realized as yet even by physicians, is that among educated people such great ignorance concerning the early symptoms of cancer exists that not more than one such person in five applies for relief at a stage of the disease when it is possible for any cure, while among the more ignorant of our labouring classes scarcely one in a hundred is seen in time."

We cannot wonder that the vast majority of cancer sufferers only apply for relief when it is too late, that most of the cancer cases brought to the surgeon for operation are practically hopeless cases. Usually, and inevitably, the surgeon is called in when it is too late.

It is widely believed that cancer kills relatively few people, that the white scourge, consumption, is infinitely more deadly. Consumption is not only a relatively pleasant disease, but it is far less deadly than cancer in England and Wales, and in various other countries. For instance, in England and Wales the deaths from cancer, from consumption of the lungs, and from other forms of tuberculosis, were as follows in 1922, according to the *Report on the State of the Public Health,* London, 1923, page 8:—

Deaths from cancer	46,903
" " tuberculosis of the respiratory system . . .	33,919
" " other forms of tuberculosis	8,858

It will be noticed that deaths from cancer vastly exceeded not only the deaths from consumption, but even the deaths from consumption and all other forms of tuberculosis combined.

During 1922, according to the Government Report mentioned, 486,780 people died in England and Wales. Of these, 46,903, or practically one-tenth, died of cancer. It is therefore fair to assume that one-tenth of the British population, or approximately 5,000,000 men and women now living, are doomed to die of cancer, provided that the cancer mortality remains stationary.

Unfortunately, there is no reason for this assumption. For a great many years the cancer death-rate in Great Britain, and indeed in all civilized countries, has been rapidly increasing. This will be shown in some detail in the fourth chapter of this book. It is true that some experts have rashly proclaimed that the cancer rate has now reached its maximum, and that it will henceforward remain stationary or decline. There is not the slightest ground for such a forecast. On the contrary, I am convinced, and I shall try to prove in the course of this book, that the cancer death-rate in England and in other advanced countries is likely to rise very greatly within the next few years unless certain counter-measures are adopted. If no appropriate steps are taken for preventing cancer, the cancer death-rate in England may rise so greatly that of the people now living, not 5,000,000, but 6,000,000, 7,000,000, or 8,000,000, may die in torments of that ghastly disease.

In the United States about 10,000,000 of those now living seem doomed to die of cancer, but, unless far-reaching preventive measures are taken in time, the number of living Americans likely to die of cancer may rise to anything from 15,000,000 to 20,000,000.

In the United States cancer may become far more prevalent than in England, for reasons which I shall give in due course.

The fact that cancer kills one-tenth of the people of England and almost one-tenth of the inhabitants of the United States does not mean that one out of every ten grown-up people die of cancer. Cancer is almost exclusively a disease of advanced age. Cancer deaths of people less than 40 years old are rare. Of those Englishmen and Americans above the 40-year limit, one in 8, one in 7, or one in 6, die of cancer according to the age period selected. That rate may rapidly rise to one in 5, one in 4, or one in 3, unless certain reforms likely to lead to the decline of cancer are initiated without delay.

A good many private people are so terrified of cancer that they frequently run to the doctor, being convinced that they have got that disease. That nervous fear is described by medical men under the name of Cancerophobia, which is almost considered as a special disease. However, the fear of cancer is greatest, not among laymen, but among those who are best acquainted with the awful sufferings connected with the disease. A number of doctors have assured me that they would rather have consumption, syphilis, and various other diseases combined, than cancer. Some doctors are almost distracted by the haunting fear of cancer. A good many medical men have committed suicide when attacked by cancer, and some have apparently ended their lives merely owing to the unfounded fear of having cancer.

Although cancer is widely believed to be non-

infectious, and although there is no very clear evidence of doctors or nurses in cancer hospitals having contracted the disease, the fear that, after all, cancer may be contagious, oppresses doctors and nurses who attend to the cancerous. A great many doctors take most extraordinary precautions against cancer infection. I have been informed that experienced nurses of mature age frequently refuse to attend cancer patients, and that these unfortunate people have to be handed over in many cases to those who are young and less experienced.

While consumption, a relatively friendly disease, is rapidly diminishing, cancer is increasing in the most startling manner throughout the world. In 1838-42 the cancer death-rate in England and Wales came to 173 per million people. In 1921 it came to 1,215 per million, having increased sevenfold in about 80 years. Although these figures, which are extracted from the British Government Report mentioned, must be viewed with considerable reserve, there is not the slightest doubt that the cancer mortality in England and Wales has increased in the most extraordinary way. During the last 20 or 30 years the margin of error in death certificates has rapidly been diminishing. However, during that period, when death certificates were very reliable, the cancer death-rate has risen continuously as follows:—

1891	. .	692 cancer deaths per million people.
1901	. .	842 " " " " "
1911	. .	992 " " " " "
1921	. .	1,215 " " " " "

In all civilized countries the cancer mortality has increased in a similar way. Dr. F. L. Hoffman, the distinguished American statistician, who specializes in cancer research, stated with entire justification in the *Boston Medical and Surgical Journal* of the 22nd February, 1923:—

"From whatever locality data are collected for a period of years, the evidence is incontrovertible that cancer is actually and relatively, as well as persistently, on the increase. . . . Those who are of the opinion that the increase in cancer is more apparent than real, base their conclusions upon guess-work, not entitled to serious consideration. The increase in cancer is a world phenomenon, and no civilized country to-day but takes cognizance of the fact. To oppose the theory of cancer increase is essentially a matter of useless controversy, unworthy of the seriousness of the questions at issue."

That the mortality of cancer has more than doubled during the last few years, not only in England but in the United States and in other countries, will be shown in detail in a special chapter, in which the often-made assertion that the increase in the cancer death-rate is rather apparent than real will be examined and refuted. Meanwhile I would, by means of the British Government Report, compare the mortality from cancer and from pulmonary consumption in England and Wales during the last 40 years.

During the 40 years under consideration, the cancer death-rate has considerably more than doubled, while the consumption death-rate has shrunk to less than half. In 1881 there were four consumption deaths for every single cancer death, but in 1921

MORTALITY PER MILLION LIVING

	From Cancer	From Pulmonary Consumption
1881	520	1,923
1891	692	1,659
1901	842	1,263
1911	992	1,035
1921	1,215	854

there were only two consumption deaths for every three cancer deaths. Since 1838–42 the cancer death-rate in England and Wales has statistically increased sevenfold. During the same period the consumption death-rate has shrunk from 3,189 per million to 855 per million or almost to one-fourth. In other words, measured by the consumption mortality, cancer in England and Wales is at present 28 times as deadly as it was in 1838. The white plague has been replaced by the black plague, and the latter is much more terrible than the former.

I stated in the beginning of this chapter that of the people now living in the British Isles, 5,000,000 were doomed to die of cancer, but that the continued increase of the cancer mortality might raise the number to 6,000,000, 7,000,000, or 8,000,000, while of the people living in the United States 10,000,000 were likely to be devoured, but that that figure might easily grow to 15,000,000 or to 20,000,000. It seems quite unnecessary that millions of Englishmen, Americans, and other civilized people should be slowly tormented to death by this ghastly disease.

I have come to the conclusion, and I shall endeavour to show in these pages, that cancer is preventable and avoidable in the great majority of cases, that it is a disease of civilization, and that cancer may be made to decline gradually and to disappear altogether as that fearful scourge leprosy which devastated the world in olden times. In the Middle Ages there were 19,000 leper houses in Europe. Leper houses were to be found even in the smaller towns. The disease was universal in civilized lands. Now leprosy has become a rarity, and occurs only in a few far-off corners. Cancer is the leprosy of modern civilization. It may never be curable, but it is certainly avoidable.

One of the extraordinary features of cancer is that it strikes down rather the strong and the well-to-do than the weak and the poor who are more likely to contract consumption. Many highly qualified observers have pointed out that cancer is a prosperity disease. W. Roger Williams, the well-known surgeon, wrote in his excellent book, *The Natural History of Cancer,* published in London in 1908, on page 66:—

"That cancer is a disease of persons whose previous life has been healthy, and whose nutritive vigour seems to promise long life, is a statement in which I entirely concur. Long-continued observation of cancer patients, in the early stage of the disease, has convinced me that most of those affected are large, well-nourished persons, who appear to be overflowing with vitality. Such types are indicative of hypernutrition. The small, pale, ill-nourished and overworked women of the type so familiar in Lancashire and

other industrial centres are seldom afflicted with this disease."

The *Zeitschrift für Krebsforschung* of 1911 contains an important paper by Dr. P. Cohnheim, entitled "Körperkonstitution beim Krebs der Verdauungsorgane," in which the author states that cancer is far more frequent among heavy people than among people of light weight. His material was collected during ten years. Of 279 cases which had been exactly observed, cancer of the digestive organs was distributed as follows:—

Patients of heavy type . . .	210	cases.
" of very heavy type . .	37	"
" of slender type . . .	29	"
" of very slender type . .	3	"

The author thinks that heavy weight involves a direct disposition for cancer of the digestive organs.

Dr. F. L. Hoffman wrote in his book, *The Mortality from Cancer throughout the World,* Newark, 1915, on page 97:—

"The Medico-Actuarial Investigation considered also the relation of build at entry to causes of death, with distinction of three divisional periods of life. Experience supports the view occasionally expressed by writers on the subject of cancer occurrence that the disease is more common among persons of overweight than among underweights, and, by inference, among the well-to-do and over-nourished than among the less prosperous element."

In another portion of his book previously mentioned, Mr. W. R. Williams, referring especially to cancer of the uterus, remarks:—

"The great majority of such persons whose life-history he had investigated had been well fed and well housed, having had nothing to do but to look after their own domestic establishment. They had usually enjoyed excellent health, most of them having had no serious illness since youth, rheumatic fever and rheumatism being the commonest diseases from which they had suffered."

On pages 354 and 269 of his book, *The Natural History of Cancer,* London, 1908, Mr. Williams writes:—

"Although it cannot be said that persons of any rank or station in life are exempt from cancer, there are, nevertheless, some remarkable differences in the incidence of the disease, among the various social strata. I have already had occasion to point out the much greater prevalence of cancer among the well-to-do and among the agricultural community, than among the less prosperous of the industrial classes in our great towns, as well as its comparative rarity among paupers, lunatics, and the prison population.

"Perhaps the most significant result hitherto attained by statistical investigation of this subject is that arrived at by Dr. Tatham, who found that the mortality from cancer during the decennium 1881–90 was more than twice as great among well-to-do men having no specific occupation, as among occupied males in general, the respective cancer mortality ratios being 96 for the former and only 44 for the latter. In like manner, Aschoff has shown that, in the Berlin population, cancer was of most frequent occurrence among persons of independent means, living on their income or pension.

"It is remarkable that a high local cancer mortality nearly always coincides with, and is indicative of, healthy surroundings. . . .

"Among the wealthy and well-to-do, where the standard of health is at its best and life is easiest, there the cancer

mortality is highest. Of this in London, Hampstead is a striking example; in Bristol, Clifton; and in Bath, as we have seen, it is the same."

Cancer is an extremely mysterious disease. There are many forms of cancer, and the scientists have given special names to all these forms. The elusiveness of the disease is increased by the fact that scarcely two cancers are alike. Hence doctors and surgeons find it often difficult to decide whether a tumour is malignant or non-malignant. The well-known surgeon, Colonel Mansell-Moullin, stated in the *Lancet* on the 21st March, 1914:—

"Cancer is not a definite entity, nor is sarcoma. The cancer of one organ differs from the cancer of every other organ, and the cancer of each individual person is as different from the cancer of all other individuals as his constitution is from theirs. . . . Each organ and each tissue has its own variety of malignant tumour, just as it has its own variety of innocent tumour, though the microscope may be unable to distinguish them, and the innocent tumours of each organ shade off by imperceptible stages into the malignant ones, so that together they form one group. No line can be drawn between them."

Although scientists have endeavoured to discover the reasons for the different outer aspects and the differing inner structures of cancer tumours which the microscope reveals, it may be that hard and soft cancers and cancers having widely differing cell arrangements are essentially one. I am inclined to believe that all cancers are identical, but I exclude sarcoma, which stands by itself.

Formerly pulmonary tuberculosis, lupus, the well-

known skin disease, tuberculosis of the joints and curvature of the spine, or humpback, were considered to be quite different diseases. We know now that these and various other manifestations, though entirely different in appearance, are practically identical, that they are caused by the tubercle bacillus. It seems quite possible that scientists are wasting their time in comparing the microscopical and chemical peculiarities of the various forms of cancer.

Cancer is mystifying the scientists not only by the endless varieties in which it appears, but also by the utterly contradictory ways of its incidence. Innumerable investigators have tried to discover the cause of cancer by comparing cancer cases in order to discover a common factor responsible for the scourge. Excellent men have spent years in research on these lines, and the result of their enquiries has been utterly disappointing.

There is a widely held belief that some article, or some articles, of food bring about cancer. In particular, meat has been suspected, and many enthusiastic vegetarians have accused meat as the causer of that disease. The cancer death-rate has indeed increased with the increase in the consumption of meat. However, we find not only that European vegetarians who have not touched meat for decades frequently die of cancer, but enquiries in India have shown that among the vegetarian tribes, where meat consumption has not taken place for centuries, cancer is about as frequent as it is among the non-vegetarian tribes. Moreover, if meat caused cancer, the

highest cancer death-rate should be in Argentina, Australia, and New Zealand, where meat consumption per head is twice as great as it is in England and in the United States. However, in these countries the cancer death-rate is relatively low. It is also very low among the Eskimos, who live practically exclusively on meat and fish. On the other hand, the cancer death-rate is very considerable in Japan, where, except in the big towns, the people eat practically no meat at all.

Abstainers from alcoholic drink are apt to hold alcohol responsible. However, on page 567, vol. 3, of the work *Dietotherapy,* published by D. Appleton and Co. in 1918, we find a long contribution dealing with "Diet in Malignant Disease of the Alimentary Tract," by Dr. Frank Smithies, in which we read:—

"Fenwick states that nearly 40 per cent. of his patients at the London Temperance Hospital were total abstainers. Reviewing 150 cases of cancer of the stomach, Osler and McCrae claim that 51·3 per cent. of their patients had used alcoholic drinks, but in only 5·33 per cent. was there a history of excessive indulgence. In the writer's series of 921 cases of gastric cancer, definite figures regarding alcoholism were obtained in 258 male patients. Of this group, 53 (20·6 per cent.) were total abstainers. Of the 205 remaining cases, 11 (5·3 per cent.) were pronounced topers. The balance claimed either an occasional debauch or took small quantities of beer, light wines, 'hard' cider, or whisky, as the desire visited them."

Various people have accused tea, coffee, tobacco, the paint and powder used by ladies, coal, gas, emanations from the earth, etc., but careful enquiry

has shown that none of these are cancer generators. Others have looked for the cancer cause among domestic animals and among vermin, and have declared cancer to be a dirt disease. Their views are refuted by the fact that the cleanest people and the well-to-do seem particularly liable to cancer, while dirty savages, who are overrun with vermin, are free from it. Various investigators have looked for the cancer cause in the use of soap among civilized people, in piped water, in vaccination, in bad teeth which are so frequently found among the civilized, in the use of sponges, in the use of enamelled saucepans, in emery employed for cleaning knives, in paper, etc., but all these enquiries have yielded negative results. With regard to possible dietetic causes of cancer, Dr. S. H. Habershon wrote in his book, *Diseases of the Stomach,* Cassell & Co., London, on page 504:—

"Enquiries have been made as to the influence of particular forms of diet in producing malignant disease of stomach. No conclusions have been arrived at, for it appears to be equally prevalent in vegetable feeders as in those who take an excessive amount of animal food. Moreover, there is no evidence that abstinence from alcohol diminishes the tendency to the disease."

Some investigators endeavour to find the causation of cancer in local conditions, suspecting that a peculiar kind of soil, rock, or some other geographical factor, might be responsible for the disease, or might at least favour its development. Mr. Alfred Haviland wrote a very interesting work, *Geographical Distribution of Disease in Great Britain,* 1892,

after many years of unceasing labour. He came to the conclusion that geographical conditions had something to do with cancer. He drew attention to the coincidence of an excess of cancer frequency in those sections of England which are more or less subject to periodical inundation and to dampness, and laid down the principle that "cancer does not thrive on high, dry soil." He stated: "The high dry sites on the older rocks are the places where cancer does not thrive, but it does thrive in the vales by the sides of large rivers which overflow their banks, and in the neighbourhood of which are to be found the drifts of ages of washings from the inhabited country above."

Many writers have followed in Haviland's footsteps. The well-known surgeon, Mr. C. P. Childe, stated in his book, *The Control of a Scourge: How Cancer is Curable,* published in London in 1907, that there was a close connection between "low-lying districts and trees and cancer." After giving some statistics, he recommended that "women should not reside in places with a damp climate or where mists and fogs prevail." Mr. C. E. Green, of Edinburgh, also stated that "towns lying in a hollow or in a cup formation have cancer death-rates decidedly above the average." Many scientists living in Germany and America have published similar views.

It is quite correct that the mortality from cancer is particularly great along damp river valleys, such as the Thames Valley, and that in damp, low-lying Holland the cancer death-rate is exceedingly high. Something might be said for the dampness theory,

but unfortunately it is absolutely contradicted by the facts. The highest cancer mortality in the world is to be found in the bracing mountains and valleys of Switzerland, Scotland, and the breezy hills of Bavaria, Austria, Sweden, and Norway, as will be shown at the end of the fourth chapter.

Every apparent clue to the cancer mystery has proved a disappointment. Every statement which seems to throw light on the subject is absolutely contradicted by another statement.

It happens not infrequently that cancer selects particular families for victims. Napoleon I, three brothers and sisters of his, and his father, died of cancer of the stomach. Many cases are known when a mother and several of her daughters died of cancer of the breast. There are supposed to be cancer districts, cancer towns and villages, cancer families, cancer streets and cancer houses. At one time the coincidence of cancer in certain circumscribed districts and along certain streams seemed to give point to the theory that cancer was caused by a micro-organism, that it might settle in the soil, especially damp soil, that it might be carried by water. However, careful enquiry has made this conclusion extremely doubtful. In the next chapter, and in a special chapter (Chapter XV) devoted to the subject, high authority will be quoted stating that it has not been proved that cancer is either hereditary or contagious.

A very original thinker interested in cancer, the Hon. F. A. Rollo Russell, in his book *Preventable Cancer: A Statistical Research,* London, 1912, drew

attention to the fact that, on the basis of official reports, the cancer mortality in prisons and in certain public institutions, such as asylums for the aged, Roman Catholic convents and monasteries, etc., was exceptionally low. He stated, for instance:—

"The low rate of cancer in prisons and asylums is the more worthy of consideration on account of the class from which those detained are drawn. The prisons include a very large proportion of hard drinkers and unsound bodies. Yet the prison regime seems to prevent the evil seeds which have been sown from germinating abundantly. Similar experiences have been related of workhouses, and many old people who have chosen to quit them have very soon succumbed to common influences outside.

"Asylums contain an excessive number of persons who have inherited or acquired constitutional weaknesses, and in many cases tendencies towards consumption or cancer; also many alcoholics who are prone to these maladies. Yet the habits and rule of these institutions reduce the cancer rate much below the rates of the classes from which they were drawn, and below the rate both of occupied and unoccupied persons."

Mr. Russell does not stand alone in his opinion that cancer is relatively rare in certain public institutions. We read on page 158 of the annual report, *On the State of the Public Health,* published in London in 1923, and issued by the Ministry of Health:—

"Various writers dealing with the subject of cancer make reference to a suggestion that the disease is rarely met with in monasteries, prisons, asylums, and similar institutions where frugal regimen is enforced. Legrain and Russell may be quoted in this connection. . . .

"In the hope of obtaining some definite information on this important question, an enquiry has been instituted by Dr. Copeman into the vital statistics of certain 'enclosed' and 'unenclosed' Orders of the Roman Catholic Church. This enquiry, which is still in progress, was rendered possible through the interest and good offices of His Eminence Cardinal Bourne."

Cancer is a bewildering mystery which has puzzled investigators for centuries. In the following chapters an explanation of the causation of cancer will be given. That explanation may cause the disappearance of all the mystifying and contradictory facts relating to the disease. My explanation will show why cancer singles out the well-to-do, the clean and the hygienically living, the energetic and the strong. It will show why cancer is particularly frequent both in low-lying damp districts and in high bracing positions. It will show why cancer is apt to prevail in certain circumscribed districts and in certain families. It will show why the cancer mortality in prisons, asylums for the aged, and in certain Roman Catholic institutions, is lower than elsewhere. It will show why cancer attacks preferably certain particular sites in women and others in men.

As shown in the beginning of this chapter, cancer is likely to claim in the United Kingdom at least 5,000,000 victims, and in the United States twice that number, if the present death-rate is maintained. However, in view of the rapid increase of the cancer death-rate throughout the world, an increase of which details will be given in the fourth chapter, there is every likelihood that of the English people

at present living, far more than 5,000,000 will be tortured to death by this disease. That seems obvious to me not only in view of reliable statistics collected, but also in consequence of my explanation of the cause of the disease. If that explanation should be found correct, it seems absolutely inevitable that the cancer mortality will rise to an unbelievable extent unless appropriate countermeasures are taken without delay.

Before dealing with the problem itself, I think I ought to show what the scientists have achieved so far in the study of cancer. I think it is only fair to my readers to describe to them what has been done and to tell them what leading scientists and practical men think with regard to cancer. They will then be able to compare my explanation with the explanations hitherto given.

CHAPTER II

Why the Cancer Problem Is the Despair of the Scientists

In the preface of this book I told that highly qualified professional men had urged me to take up the investigation of the cancer problem. They informed me that the enquiries of those engaged in research had yielded hardly any practical results, that the mystery of cancer was as great as it had been in the past, that science knew practically nothing as to how cancer was caused and how it could be prevented, that possibly an amateur might succeed where professional research had failed. When I enquired more closely into the cancer problem, I found that practically all scientists, surgeons, and physicians despaired. Apparently the useful knowledge as to the cause and treatment of cancer is approximately as limited as it was a thousand or two thousand years ago.

Cancer is one of the oldest diseases known to medical history. Dr. James Ewing stated on page 17 of his excellent treatise on *Tumours,* 2nd Edition, published by the W. B. Saunders Co. in 1922:—

"The Ancients knew cancer well. They treated it by excision and by a variety of escharotics, including the Egyptian arsenical ointment. Cancer is mentioned in the

Papyrus Ebers (1500 B.C.) and in the oldest remnants of the literature of India and Persia.

"Hippocrates (460 B.C. to 375 B.C.) received from earlier days a considerable body of descriptive facts regarding cancer of the skin, breast, uterus, and internal organs. . . . Herodotus mentions that Democedes (520 B.C.) cured Atossa, the daughter of Darius Hystaspis, of breast cancer, and Hippocrates burnt out a carcinoma of the neck, the earliest record of diathermia.

"Celsus (30 B.C. to A.D. 38) distinguished several gross varieties of cancer, and he excised breast cancer, advising against removal of the pectoralis major. Treatment by charcoal was employed by Cato, and a variety of crude internal remedies are mentioned by Pliny. . . .

"For internal cancer, of which little was known, a diet chiefly vegetable was recommended. Walnuts were specifically forbidden. Diagnosis rested chiefly on the cause of the disease, while treatment by excision, ligation of vessels, and cautery were comparatively successful. Leonidas of Alexandria (A.D. 180) broke away from Hippocrates' conservatism, dissected out breast cancer extensively, cutting through healthy tissue with knife and cautery, and approached closely to the modern technics of this operation."

Apparently cancer has been known to medical science since the dawn of civilization. It is one of the most terrible diseases existing. It does not spare the wealthiest and the most powerful. On the contrary, it singles out for attack those who enjoy all the advantages which civilization yields and who can dispose of all the means of protection against disease which medical science and surgical experience can provide. It is therefore most humiliating to read that "Leonidas of Alexandria (A.D. 180) broke away from Hippocrates' conservatism, dis-

sected out breast cancer extensively, cutting through healthy tissue with knife and cautery, and approached closely to the modern technics of this operation." One of my friends told me when I began my studies: "We know as little about cancer as did the Greeks and Romans and the barbarians who preceded them." His opinion was fully confirmed by my studies. Sir John Bland-Sutton, the celebrated surgeon, wrote in his work, *Tumours: Innocent and Malignant,* 1917, under the heading "Carcinoma":—

"Although this disease was recognized in the dawn of medicine, we not only remain ignorant of its cause, but in many instances the diagnosis of the malady is uncertain in the living. This is not due to supineness on the part of investigators, but to the absence of what is called 'specific symptomatology.'"

Messrs. Deaver and McFarland stated on page 476 of their book, *The Breast: Its Anomalies, its Diseases and their Treatment,* published in 1918:—

"A generation of workers have laboured with great industry, intelligence, and patience, and a mass of information has been collected, but when it is carefully sifted, we find ourselves very much where our forefathers were, so far as any clear ideas of the cause and nature of cancer are concerned. But what is most disappointing, we are precisely where they were so far as the treatment of the disease is concerned. All that they knew was that the proper thing to do for cancer of the breast was to remove it. All that we know is to remove it. We do it with less pain than they, thanks to anæsthetics; we do it with greater safety than they, thanks to antiseptics and aseptics;

we do it with less probability of its return than they, thanks to better technique, but we still do nothing to cure it.

"If there be a disheartening subject to think about or to write about in connection with the much vaunted progress of modern medicine and surgery, it is our inability to penetrate into the mystery of this disease."

Dr. W. S. Bainbridge, the well-known American professor of surgery, summed up the views held by the profession on page 128 of his book, *The Cancer Problem,* published in 1914, by stating:—

"While the modern experimental investigation of cancer has thrown considerable light upon certain predisposing factors in the production of cancer, the essential cause is yet to be discovered. Perhaps the most practical outcome of such study is the emphasis to be placed upon the removal of all possible sources of chronic irritation, and of benign neoplasms which are subjected to irritation."

The best informed frankly confess that the investigations of thousands of patient researchers have yielded only negative results. Dr. Francis Carter Wood, the eminent director of the Institute of Cancer Research at Columbia University, New York, stated in his interesting article, "Cancer: Its Prevention and Cure—What Medical Science Knows about it and What can be Done to Relieve it," which was published in the English edition of the *World's Work* in July, 1923:—

"There are families in which all ordinary irritation never produces cancer. In others, the great frequency with which cancer occurs in a number of generations points to a tissue susceptibility which permits the development of cancer from irritations so slight as not to affect

the more resistant type. Nevertheless, it is almost certain that if those born in even the most susceptible families would avoid all sources of irritation, cancer would not occur. . . .

"Variation in diet does not in any way influence the development or growth of cancer. It has long been a popular belief that meat-eating causes the disease, and some of the dietary quacks still preach this doctrine, quite oblivious of the fact that the validity of such a theory would spell disaster to the Esquimaux race, whose food is almost wholly meat. A similar popular fallacy is that a vegetable diet prevents the occurrence, or checks the growth, of cancer after it has begun, ignoring the fact that horses and cows, which are vegetarians, frequently develop the disease, as does also the human vegetarian. The best demonstration of the fallacy of food cures is given, however, when large series of animals, each one grafted with the same tumour, are kept on different diets for long periods of time with an equal number of control animals on a standard diet. No change is noticeable in the steady, progressive growth of the tumours when the two series are compared.

"Even starvation does not check the tumour growth in man. The cancer and the body fight for such food as is available, and the cancer always wins. The low food supply in Germany during the war, while it greatly reduced the frequency of gout and diabetes, was shown to have no effect on tumour growth or on the birth weights of German babies. . . .

"It has long been the hope and earnest endeavour of the medical profession to discover some simple form of drug or serum which would cure cancer, but unfortunately this has not yet been accomplished, and the reason is obvious. If cancer is merely an overgrowth of the normal cells of the body, how can a cancer cell be destroyed by medicine without at the same time destroying the healthy cells? And in this dilemma lies the problem of the

medicinal cure of cancer. Unless some constant difference can be found between cancer cells and the corresponding normal cell, such a remedy will never be obtained. Much time and research has been spent by scientific men in order to find some such difference, but so far the search has been fruitless, for the more carefully the cancer cell is studied, the more we find it resembles, in almost every particular, rapidly growing cells of the normal type. The analogy with bacterial diseases fails completely here, for most of the parasites which are present in the body are either vegetable or low animal forms. . . .

"The probability is that only after long periods of careful and patient studies will we find some difference between the normal cell and the cancer cell which will enable us to attack it. That phase of the problem, however, offers no present prospect of solution."

Mr. Wood's view is thoroughly disheartening. It is, of course, impossible for human beings to "avoid all sources of irritation." He points out that in his opinion diet has little or no influence upon cancer, and he despondently concludes that "the hope to discover some simple form of drug or serum which would cure cancer" is likely to be vain, that most probably "such a remedy will never be obtained," that "research . . . so far has been fruitless," that the scientific attack upon the cancer cell "offers no present prospect of solution."

On the 14th August, 1923, the British Ministry of Health sent a circular, No. 426, to all the local authorities. It was superscribed "Cancer," and it was intended for the guidance of the authorities to whom it was addressed. Naturally, the Ministry of Health desired to give the best advice to the local authori-

ties. The memorandum stated in the preface that its object was "to summarize in non-technical terms our present knowledge with regard to the ætiology and incidence of cancer, and to offer for the consideration of local health authorities some suggestions which it is hoped may be useful to them in their efforts to inform public opinion on this important subject." The memorandum contained the best information available. It was written by highly qualified men who were fully acquainted with the subject and with the latest discoveries of the scientists. However, the information given was disappointingly negative, for we read:—

"The root cause or causes on which the occurrence of cancer depends remain obscure. We do not possess any specific means of producing immunity against cancer, as we have against smallpox, nor have we any specific means of curing the disease analogous to quinine for malaria or arsenobenzol compounds for syphilis. . . .

"It is right to point out that *hereditary* predisposition to cancer has not at present been proved to be of any practical importance to man; that it cannot be asserted with scientific authority that the use of any particular article of food increases the liability to cancer, or prevents it from appearing; that no known drug or preparation will prevent its appearance or cure it when present; and that no danger of cancer has been proved to result from inhabiting houses or districts in which cancer happens to have been exceptionally common. There is no evidence to show that cancer is an infectious or contagious disease. . . .

"Since cancer occurs more commonly in certain sites, it is prudent to notice and remove causes of chronic irritation in these sites. Apart altogether from cancer,

people should attend to these conditions in the exercise of common care for the general health and fitness.

"In this category, for example, and for reasons just given, come the removal of rough stumps of teeth or replacement of badly fitting dentures; a change of habit if pipe smoking is found to produce soreness on the same spot of the lip or tongue; an alteration of clothing which causes irritation of particular regions of the body—for example, the breast; the avoidance of constipation and other like matters. On the same basis the possibility of establishing a chronic irritation in a region liable to cancer gives an additional reason for obtaining advice and treatment in disorders of the stomach, bowels, or womb. Finally, special precautions, the nature of which is well known to those concerned, must be adopted in certain occupations (tar, etc.) known to entail superadded and specialized risks of cancer."

As the British Government memorandum tells us that "the root cause or causes on which the occurrence of cancer depends remain obscure," and that "we are far from being able to say how cancer is to be avoided," it is perfectly obvious that the memorandum scarcely contains "suggestions which it is hoped may be useful to the local authorities in their efforts to inform public opinion." The British Ministry of Health cannot express any opinion as to whether cancer predisposition is hereditary or not. It has no opinion to offer with regard to the selection of food and cannot express a favourable opinion on any known drug or preparation. The views of the Ministry of Health are as negative as those given by Mr. Francis Carter Wood, of Columbia University, previously quoted.

Early in 1922 the *British Medical Press and Cir-*

cular published a special number devoted to cancer. On page 282, Sir D'Arcy Power, the great surgeon, frankly confessed that cancer was a mystery which would be solved "when the cause is discovered." He hoped that this discovery would be made at some future date, telling us:—

"Many things which are now obscure will be explained when the cause of cancer is discovered. It will then be possible to say, for instance, why cancer does not always run a straightforward course; why recurrence is some times delayed even for so long as 20 years; why, more strangely still, the patient may remain free from any further manifestation even after one or two recurrences; why a husband and wife die of cancer occasionally within a short time of each other; why the disease appears to be unduly prevalent in certain districts and countries; and lastly, why its incidence is steadily increasing among the men of civilized races."

Many scientists deny that cancer is caused by a micro-organism. They also deny that the disease is contagious. The British Government memorandum previously quoted expressly states: "It is right to point out that hereditary predisposition to cancer has not at present been proved to be of any practical importance to man. . . . There is no evidence to show that cancer is an infectious or contagious disease." That opinion is flatly contradicted by many eminent surgeons and scientists. For instance, M. Victor Pauchet, the eminent French surgeon at the hospital Saint-Michel, wrote in his pamphlet, *Le Cancer: Peut on l'Eviter? Comment le Traiter,* published in Paris in 1923:—

"Cancer is due to an unknown germ, and it is sometimes contagious. Why have people denied for so long that there is a cancer microbe and that the disease is contagious? Because the microscope has not revealed its existence. Why then do I believe that cancer is caused by a micro-organism? Because there are proofs that it is contagious. There must be contagion because there are cancer families, cancer houses, cancer valleys and cancer provinces. How can these facts be explained except by contagion? But why have so many doctors denied for so long that cancer is contagious? Because the disease takes so very long in developing and showing itself. Some years ago a doctor in Hayti inoculated a prisoner condemned to death with leprosy. However, leprosy developed in the individual only after five years. Now, because it develops only very slowly, and because cancer requires favourable soil, doctors deny that it is contagious . . . A province becomes cancerous because there may be a cancerous family which spreads the disease in the course of 10, 20, or 30 years."

According to Dr. Pauchet, cancer is caused by "an unknown germ and is contagious," and a great many scientists and practitioners agree with him.

While some experts believe that cancer is caused by a micro-organism, and while others hold that it is not so caused, there are well-known authorities who think that the disease may be due to the combined action of a micro-organism and some more or less obscure general cause. For instance, Dr. John Round contributed an important article, "Cancer a Disease of Deficiency," to the *American Medical Record* of 1918, which will be found in vol. 94, page 185. He states in it:—

"It is reasonable to assume that there is both a local and a general factor in cancer; the local factor is probably

a microparasite which stimulates the epithelial cells of adults to multiply in somewhat the same way as the male gamete initiates reproductive changes in the female gamete.

"The general factor is an abnormal condition of the blood, dependent on poverty of vitamines and on the presence of certain unoxidized toxins absorbed from the alimentary canal which favour the development of the local factor. First of all, deficiency of vitamines in the food we eat, to which subject we shall return later; secondly, the absorption of toxic products which enter the blood as a result of altered or overtaxed intestinal mucous membrane and the reabsorption of toxins as a result of intestinal stasis, commonly called constipation. It must not be forgotten that cancer affecting some part of the alimentary canal is often the end result of old-standing constipation.

"There is a certain analogy existing between tuberculosis and cancer; in the former we have a well-understood bacillus with a known antitoxin and a general condition of bad health which no physician or surgeon disputes. In cancer we can only presume the incidence of a parasite, while we are only too familiar with the accompanying state of bad health.

"A diet which taxes the thyroid and is low in vitamines causes an increase in cancer. The general treatment must be preventive and curative, and at both stages will include the avoidance, or treatment, of constipation."

As the microbe of various diseases has been found, many investigators and the general public hope that the cancer germ may be discovered and that cancer will be eliminated by the destruction of that germ by means of a suitable antidote which will kill the germ without harming the patient. It seems very questionable whether there is a special cancer micro-organism. Even if some particular micro-organism

should be found in cancer patients, that micro-organism might not be the cause of cancer, but might merely find in cancerous persons a congenial soil. I would draw attention to the fact that beri-beri, which is now known to be mainly a deficiency disease, was thought not so long ago to be due to a microbe. I have before me the excellent handbook, *Tropical Medicine, Hygiene and Parasitology,* by Gilbert E. Brooke, published by Chas. Griffin & Co. in 1908. Under the heading "Etiology" we find the following:—

"The specific cause and method of propagation of beri-beri have caused endless discussion, and are still shrouded in mystery.

"Some of the many theories may be here put forward and briefly discussed:

"1. Gelpke's Theory. That the disease is due to a dried fish infected by a trichina.

"2. Grimm's Theory. That it is caused by ingestion of infected fish.

"3. Miura's Theory. That it is caused by ingestion of certain kinds of raw fish.

"4. Ross's Theory. That it is due to arsenical poisoning.

"5. Takaki's Theory. That it is caused by nitrogen starvation.

"6. Grogner's Theory. That it is due to a hæmamœba.

"7. Braddon's Theory. That it is caused by ingestion of a specific organism growing on mouldy rice.

"8. Hose's Theory. That it is due to the ingestion of mouldy rice.

"9. Manson's Theory. That it is due to a place germ —earth, floor, or house—which distils a volatile or stable toxin, of which the inhalation or ingestin causes the disease.

"10. Laurent's Theory. That it is caused by a deficiency of fat in the diet.

"11. Trentlein's Theory. That it is due to oxalate poisoning.

"12. Pekelharing and Winkler's Coccus. That it is due to a white liquefying coccus, requiring repeated introduction.

"13. Hamilton Wright's Bacillus. He considers that a certain specific bacillus lies dormant in certain localities, that it gains access to the body by the mouth, giving rise to a primary duodenal lesion. The resulting toxin produces the characteristic effects on the peripheral nerves, while the organism itself escapes in the fæces.

"14. Tsuzuki's Coccus. Tsuzuki has isolated a diplococcus, not from the blood, but from the urine—the Micrococcus beribericus.

"Although the specific cause has not yet been discovered, it is almost certainly an extra-corporeal animal or vegetable parasite, entering the body by one of the usual channels, and there producing the toxin which causes the characteristic nerve degeneration.

"There is no evidence to incriminate any definite food, drink, or intermediate host."

In the third volume of the *Encyclopædia Britannica*, 11th Edition, published in 1910, we read under the heading "Beri-Beri":—

"The cause is believed by many authorities to be an infective agent of a parasitic nature, but attempts to identify it have not been entirely successful. It is not obviously communicable from person to person (Manson), but may be carried from place to place. It clings to particular localities, buildings, and ships, in which it has a great tendency to occur; for instance, it is apt to break out again and again on certain vessels trading to the East. It haunts low-lying districts along the coast and the banks of rivers. Moisture and high temperature are required to develop its activity, which is further favoured by bad ventilation, overcrowding, and under-feeding."

The "parasite" of beri-beri existed either in the imagination of scientific investigators, or a particular parasite chose to settle upon people suffering from that terrible disease.

A Dutch doctor, named Eijkman, who was medical officer to a prison in Java where there was much beri-beri, noticed that the poultry of the establishment suffered from a disease similar to beri-beri, displaying the characteristic paralytic symptoms, and that they died with extensive degeneration of the peripheral nerves. As these fowls were largely fed upon the rice consumed at the prison, it occurred to him that the disease might be due to rice. Careful investigation showed that beri-beri was very frequent in all those prisons where polished rice was used, while there was little or no beri-beri where unpolished rice was employed. The change from polished rice to unpolished rice rapidly brought fowls and humans back to health. Obviously the skin and germ of the rice grain, which were taken off in the process of polishing, contained some matter vitally important to the organism of men and fowls, a "vitamine," the lack of which produced a terrible disease.

Beri-beri was considered "contagious" and was believed to be caused by a "micro-organism" because it was particularly prevalent in certain districts, in certain prisons, and on certain ships. That was only natural, because, wherever beri-beri occurred, polished rice was habitually used. The most energetic disinfection, improvement of the drainage system, etc., proved, of course, quite useless.

In one of the extracts given, fourteen different scientific theories relating to the cause of beri-beri were enumerated. These theories were put forward by very eminent observers. However, all proved wrong, and the cause of the disease was found to be exceedingly simple. Hence beri-beri could be dealt with without much difficulty. The theories relating to the cause of cancer are quite as numerous as those which were put forward with regard to beri-beri. To readers of this book the cause of cancer may presently seem as simple and as plain as that of the terrible rice disease.

As a few diseases are due to certain micro-organisms which have been isolated during the last few decades, the fashion has arisen of attributing nearly every disease to some infinitely small organism which may be destroyed by means of vaccine, a serum, etc. The idea that hundreds of vaccines and serums may be evolved for dealing with hundreds of diseases, and that men may have dozens of serums squirted into their bodies in the course of a few years, is rather terrifying. Happily the most efficient serums are distilled by our own bodies if our bodies are in good health. Prevention is better than cure. Those who live normal, sensible lives rarely fall victims to disease, and they require neither medicines nor serums, because their bodies produce the anti-toxins, etc., which are required. The indiscriminate use of serums may do far more injury to mankind than the indiscriminate use of patent medicines. Medicines administered by the mouth are more easily eliminated by the wisdom of

the body than those administered subcutaneously. The search for a vaccine or serum for fighting cancer may prove as disappointing as the search made for a serum which was to destroy the imaginary beri-beri microbe.

It is scarcely necessary to describe or to enumerate the many contradictory theories relating to the causation of cancer which have been put forward by physicians, surgeons, biologists, chemists, biochemists, and others. Those who wish to study them will find them in the handbooks, such as Bainbridge's *Cancer Problem* and Wolff's work, *Die Lehre von der Krebskrankheit.*

While scientific specialists have endeavoured to discover the cause of cancer in abstruse theories which only the initiated can understand, a great many practical surgeons and physicians consider the cancer problem with frank despair. They believe that the disease is not preventable, and that excision is practically the only remedy. Mr. Charles P. Childe, Surgeon of the Royal Portsmouth Hospital, wrote a book of three hundred pages which bears the hopeful title, *The Control of a Scourge: How Cancer is Curable.* I opened it with keen expectation, but I was deeply disappointed. The only "cure" which the author suggests is early operation. Of the "control of the scourge" in the true sense of the word, the book says nothing. In the concluding chapter the author proclaims in italics: "A little knowledge, a little resolution, a little courage, these are the cures for cancer." Mr. Child's

views are shared by a great many practical physicians and surgeons.

Happily some leading scientists, surgeons, and physicians are becoming convinced that the problem of cancer cannot be solved by means of the microscope and of the test-tube. They are becoming convinced that the great majority of those engaged in research are the victims of laboratory theories who have lost their way in a maze of contradictory doctrines. The experiments made on tens of thousands of mice, rats, and other animals are not very illuminating. After all, the problem is not to cure artificially caused cancer in animals, but cancer in men.

Many practical surgeons and doctors are becoming convinced that the cancer problem is a biological problem, and that prevention should rather be studied than cure. Dr. Frederic S. Lee, Professor of Physiology at Columbia University, wrote in his book, *Scientific Features of Modern Medicine,* published in 1911, page 121:—

"The problem of cancer becomes larger every day. It has come to be realized that it is a broad biological problem, and that it can be solved only by a fuller understanding of biological laws. There are two material objects to be studied, the cancer itself and the body in which it occurs. There constantly occur physiological interactions between these two, and the nature of these interactions must be discovered. The prevention or the cure of cancer is the goal that is of most general human interest."

Elie Metchnikoff, who, as head of the great Pasteur Institute, rendered the most valuable services to medicine, and especially to sero-therapy, clearly

saw that hygiene is far more important than cure. He wrote on pages 2 and 14 of his book, *The New Hygiene,* published in 1906:—

"Although therapeutics have gained many most important victories, yet to hygiene belongs without a doubt the place of honour in modern medicine. It is in the prevention of infectious diseases that the interest of medical art is now mainly centred. But, whereas formerly all preventive measures were based on insufficient and often erroneous knowledge, they nowadays are founded on truly scientific data. . . . The essence of immunity lies in the living elements of the body."

Sir Arbuthnot Lane also has far more faith in prevention than cure. Hence he is chiefly interested in studying the origin of those diseases which are brought to him for operative treatment. He stated in his book, *The Operative Treatment of Chronic Intestinal Stasis,* 4th Edition, London, 1918, on page 69:—

"We have got to investigate primary causes, and to study their relationship to so-called diseases."

Except in a few cases, the scientific fight against disease by discovering and destroying the micro-organism causing it has proved singularly disappointing. We know how to prevent smallpox. The discovery of the benefit of vaccination was not made by Dr. Jenner, but was made in the first instance by an obscure milkmaid who had observed that milkers with chapped hands, who had been milking cows with smallpox of the udder, did not catch that dreaded disease, which in its time was as deadly as

cancer is now. Smallpox is no longer destroying one-tenth of the population. It has practically been eliminated by vaccination. However, vaccination against smallpox is done quite unscientifically, inasmuch as scientists have not yet succeeded in discovering the elusive micro-organism which causes the disease. As science has failed to find the minute causer of smallpox, which must exist because the disease is highly infectious, it may fail to discover the very problematical micro-organism which is supposed by many to cause cancer. The great majority of experts believe that cancer is neither hereditary nor infectious, and I am somewhat inclined to agree with them, with reservations of common caution, for reasons which will be given in due course.

Even if a micro-organism which causes a certain disease is known, it may not be possible, or it may not be convenient, to fight the disease by a suitable serum. That may be seen by the example of the common cold. Colds are not caused by chills, as is frequently assumed, but they are "caught" from people. The micro-organisms of colds cannot exist in high altitudes and in northern regions where the temperature is very low. Hence mountaineers do not suffer from colds as long as they are on the hills, and Polar explorers also are immune, but a Swiss hillman is apt to catch a severe cold when he goes shopping in the valley. Some of the micro-organisms causing colds have been isolated, but it has not yet been found possible to evolve an efficient antidote. Cold-germs settle chiefly on those whose

power of resistance has been lowered by a chill. In those who do not suffer from a chill, Nature distils, as a rule, the antidote, the natural medicine which destroys the invading cold-germs. Hence the best way of preventing colds is still the old-fashioned way of hardening the body. Similarly, the best way of avoiding tuberculosis, cancer, and many other diseases, does not lie in discovering new serums and drugs which may do more harm than good, but lies in the strengthening of our bodies. A perfectly healthy man may breathe in tuberculosis germs every day, but he will not get tuberculosis. His body eliminates or destroys these germs. Mingling with people suffering from various diseases, his body will receive disease germs without number, which, however, will fail to bring about disease. Cancer never attacks a perfectly healthy organ or a perfectly healthy tissue.

Sir Arbuthnot Lane wrote on page 8 of his pamphlet, *Chronic Intestinal Stasis and Cancer,* London, 1923: "Cancer never affects a healthy organ."

A great authority on cancer, Dr. Joseph C. Bloodgood, of Baltimore, wrote in the *Boston Medical Journal* of 1923, vol. 188, page 227:—

"Cancer never begins in a healthy spot. There is always some defect there first, which is not cancer. Anyone who can see or feel will know of this little skin lesion, which may have been present since birth, or have been observed but recently, or which has formed since an injury, or a pimple. These little skin defects are black moles, warts, areas of scaly skin, with or without scabs, little nodules like shot or peas or definite sores, unhealed ulcers. Cancer

does not begin in every one of these little skin defects; but these skin defects are like mushrooms, which look alike to the ignorant. . . .

"If one wishes to be protected from death of cancer of the skin, one should consult one's medical advisor and find out whether the skin defect or defects are of the dangerous kind. If it is, it should be removed properly, and in this way one is protected from cancer. . . .

"Every one who observes on the lip, tongue, or mouth a fever blister, a canker sore, a red area, an unhealed sore of any kind, an area of irritation, or anything that can be seen and felt different from the normal mucous membrane, should stop the use of tobacco in any form and see their dentist and medical adviser. Smokers who observe burns on the lip, or white patches (Leucoplakia) on the lip, tongue, or mouth, should discontinue the use of tobacco in any form."

Dr. W. M. L. Coplin, another high authority, stated in the *Journal of the American Medical Association* of the 20th May, 1922:—

"More than 40 years ago Billroth observed that cancer did not develop in the normal mamma; it is doubtful whether it ever arises in the absence of some antecedent lesion. Often, as in the skin, such phenomena may be recognized, and it is equally likely that concentrated clinical and pathological enquiry may lay these processes open to diagnosis in other tissues and organs, as well as in the breast. These beginnings of malignant disease, even those processes that may precede it and constitute possibilities, must be better known and treatment directed toward potential dangers of cancerous evolution, if the best results are to be attained. Therein lies prevention, which here, as elsewhere, is far more promising than the best results attainable by any method after malignancy has fully developed."

Many other British and American authorities might be given in support of the important statement that "cancer never begins in a healthy organ or a healthy tissue." However, the three statements quoted may suffice. They offer a key to the cancer problem.

To avoid cancer by remaining healthy is far more easy than to cure it when our health has broken down.

I am afraid the cancer research workers, whose labours I admire, have been working in a wrong direction. The causation of cancer should be perfectly clear to all who have studied the cancer facts in general. Unfortunately, over-specialization has prevented most cancer students to survey the problem as a whole. Dr. Archibald Leitch, the distinguished director of the Cancer Hospital Research Institute in London, gave in the summer of 1923 a lecture on "The Experimental Enquiry into the Cause of Cancer," which will be found reprinted in the *British Medical Journal* of the 7th July, 1923. In the course of his address, Dr. Leitch stated with admirable modesty:—

"A future generation, knowing surely the causes of cancer, will have no patience with our flounderings, our guesses, and our contending arguments. Had we not all the facts before us, they will say, staring us in the face, clamouring for recognition? Probably we have, but we are like children gazing at a starry sky—the stars that are so bright to us may be very small worlds, and those that we barely see may be infinitely great. When we can place our facts in their order of importance, and make order out of seeming disorder, the answer will be easy."

I have tried to act in accordance with Dr. Leitch's idea. I have merely "placed the known facts relating to cancer in their order of importance," and have endeavoured to "make order out of seeming disorder."

CHAPTER III

Cancer is a Disease of Civilization—It is Almost Unknown amongst Primitive Tribes

Scientific investigators are always hampered by the strong critical faculty, or by the love of contradiction, of those who do not agree with them. Innovators are not loved by those who hold generally accepted views. In science there is as strong a vested interest as there is to be found anywhere else. Columbus and Galileo were persecuted. Beethoven and Wagner were held up to contempt for a long time. The discoveries of Pasteur were greeted with derision.

For a great many years, writers on cancer have pointed out that that terrible disease, which has been prevalent in all civilized countries since the earliest ages, is extremely rare and almost non-existent among primitive races. That assertion has frequently been challenged and contradicted. That may be seen by looking through the medical literature of the past.

During the last two or three decades, when, owing to the rapid spread of cancer, great well-endowed cancer research organizations were created in many countries, writers here and there drew attention to the fact that cancer was a disease of civilization.

That view was denied by a great many scientists and investigators, and we were told that cancer was a kind of natural affliction which visited not only men regardless of clime and colour, but that it was practically universal, that it was found in mammals, in birds, in fishes, and even in trees. Various cancer research organizations have dealt exhaustively with cancer in plants, and innumerable experiments have been made with animals in order to find out whether animal cancer was hereditary or infectious. Animals have been fed on human cancer matter, etc.

Unfortunately, those writers who maintain that cancer is a disease of civilization give only very meagre proof in support of their view. In most books, addresses, etc., in which it is stated that cancer is a disease of civilization, the evidence is restricted to one or two opinions received from a doctor residing in the wilds of Africa or Asia.

I would like to settle in this book for all time the question whether cancer is indeed a disease of civilization or whether it is not. Therefore, instead of giving one or two opinions which may prove exceptions confirming the rule, and which may be countered by one or two statements to the contrary made by medical men residing in the tropics or elsewhere, I intend to overwhelm my readers by an enormous amount of evidence at the risk of wearying them. After all, it is better that the readers of this book should be wearied but convinced than that they should be entertained and remain in doubt. I shall therefore quote twenty or thirty authorities, the combined evidence of whom must prove

convincing to all, even to the most sceptically inclined.

A considerable number of distinguished authorities have asserted in general terms that cancer is a disease of civilization. Their assertions were based, no doubt, upon reliable reports which they had received in the course of time. For instance, Dr. Frederic S. Lee, Professor of Physiology at Columbia University, wrote on page 113 of his book, *Scientific Features of Modern Medicine,* published in 1911:—

"Cancer is comparatively rare among savage races. It is a disease of civilization, and, as the storm and stress of civilized life become more turbulent, it seems to become more frequent. . . ."

The *Lancet* of the 28th July, 1923, contained an address, "Environment and Health," being the Presidential Address delivered at the annual meeting of the British Medical Association in Portsmouth on the 24th July, 1923, by Mr. Charles P. Childe, the Senior Surgeon of the Royal Portsmouth Hospital. Referring to cancer, Mr. Childe stated:—

"The humiliating confession must be made that we know very little about it. That it has some relation to civilized environment seems evident from the fact that it is a comparatively rare disease among primitive races, and that it is certainly making rapid headway among all civilized peoples. But of the nature of the environment favouring its activities we are in complete ignorance. It is neither foul air nor fresh air, neither hardship nor indulgence, neither poverty nor riches. . . .

"The only things we know about it which are worth knowing are its age-incidence, its relation to chronic irrita-

tion, and the fact that it is in its beginnings a local disease, and that, therefore, it can be cured by early removal in those situations where removal is possible. This is practically all we know about cancer."

Dr. Victor Pauchet, surgeon at the hospital Saint-Michel, wrote in his pamphlet, *Le Cancer,* published in Paris in 1923:—

"Constipation leading to intestinal intoxication is a factor which predisposes for cancer. That habitual constipation is due to bad education among civilized peoples. Doctors, practising in the colonies, assert that stagnation of the bowels and cancer are both practically unknown among primitive peoples who live in the open air, who take plenty of exercise, and, lacking lavatories, obey the call of nature whenever prompted. They act like animals in this respect, and therefore are free from intestinal intoxication and its cancerous consequences."

Dr. F. L. Hoffman, the eminent American statistician, wrote on page 146 of his excellent book, *The Mortality from Cancer throughout the World,* 1915:—

"The rarity of cancer among native races suggests that the disease is primarily induced, or at least increased in relative frequency, by the condition or methods of living which typify our modern civilization. There are no known reasons why cancer should not occasionally occur among any race or people, even though it be of the lowest degree of savagery or barbarism. Granting the practical difficulties of determining with accuracy the causes of death among non-civilized races, it is nevertheless a safe assumption that the large number of medical missionaries and other trained medical observers, living for years among native races throughout the world, would long ago have provided a more substantial basis of fact regarding the

frequency of occurrence of malignant disease among the so-called 'uncivilized' races, if cancer were met with among them to anything like the degree common to practically all civilized countries. Quite to the contrary, the negative evidence is convincing that, in the opinion of qualified medical observers, cancer is exceptionally rare among primitive peoples, including the North American Indians and the Esquimo population of Labrador and Alaska. Evidence is also available to substantiate the conclusion that cancer was of relatively rare occurrence among our negro population during a condition of slavery, but that the frequency rate has rapidly increased during the last thirty years, until at the present time cancer of the uterus is proportionately more common among negro women than among the white women living under much the same conditions of life in the same localities."

The four authorities quoted are representative of a great many competent observers who maintain that cancer is little known, if not unknown, among primitive peoples. Now let us listen to the first-hand evidence of reliable observers who have been living among primitive peoples.

Dr. Tanchou, one of the most eminent French doctors of his time, who took a special interest in cancer, stated on page 263 of his valuable book, *Tumeurs Cancereuses,* published in 1844:—

"Cancer, like insanity, seems to increase with the progress of civilization. In the Orient it is said that cancer is far more frequently found among Christians than among Mohammedans. Dr. Bax has never found cancer in Algeria and on the Senegal, where he practised during 6 years.

"M. Guyon, the principal surgeon of the African Army, wrote to me:

"'In the North of Africa and in tropical America, where I have practised during 12 years, cancer is very rare. I have before me a list of deaths in the town of Algiers for 1841 and 1842, which contains not a single death from cancer.'

"Several officers of our army have told me the same thing. M. Baudens, who has a large civil practice in Algiers, where he has been working for 8 years, has found cancer only in two or three cases.

"Dr. Pouzin, who in 1831 created a hospital among the Arabs, has found cancer only once in a woman, although 10,000 sick have been seen by him in his hospital. . . .

"To sum up, I think we may conclude that the number of cancer cases is increasing from year to year, and that this increase stands in connection with the advance of civilization."

Particularly interesting among the primitive races are the North American Indians. They live in districts where there is a great deal of cancer among the whites. Moreover, they are great meat-eaters and smoke a good deal. Dr. F. L. Hoffman wrote in his article, "Progress and Results in Cancer Control," published in the *Boston Medical and Surgical Journal* of 22nd February, 1923, basing his statement on a careful investigation of his own:—

"Among our native Indians cancer is very seldom met with among those who are of pure blood; while during my recent investigations in South America I failed to find a single case of cancer of the breast among thousands of native women, as to whom enquiry was made for the purpose."

The same authority informed us in his pamphlet, *New Aspects of the Problem of Cancer Control*:—

"Among the full-blood Indians cancer practically never occurs. I have made special enquiries among the Navajos and Zunis, but failed to find a single recorded case. But even more impressive is the result of a recent enquiry by means of a questionnaire sent out to 127 agency physicians, including practically the entire country and a total Indian population of about 115,000. Sixteen out of 71 reported no cases of cancer of the skin, twenty out of 71 reported no cases of cancer of the mouth, twenty-one out of 71 reported no cases of cancer of the breast, and thirteen out of 68 reported no other form of malignant disease. In the remainder of the reports cancer was referred to, in the large majority of cases, as of rare occurrence, and only in very few as of average occurrence, probably chiefly among tribes largely intermixed or intermarried with the white population. . . ."

In his address "Cancer and Civilization," read before the Belgian National Cancer Congress in Brussels in November, 1923, Dr. Hoffman stated, referring to the American Indians:—

"I may direct attention to a return made to me by the Division of Vital Statistics, of the United States Bureau of the Census, for the registration area, for the year 1921. During that year there were recorded 849 deaths of male Indians, of whom 21 died from cancer and other malignant tumours, or 2.5 per cent. of the mortality from all causes. Of the 21 deaths, none were from cancer of the buccal cavity, 13 were from cancer of the stomach and liver, 3 from cancer of the peritoneum, intestines, and rectum, while 5 were of other parts or organs unspecified. The number of deaths of Indian females was 876, of which 28, or 3.2 per cent., were from cancer or other malignant tumours. There were 2 deaths from cancer of the peritoneum, intestines, and rectum, 9 from cancer of the female generative organs, and 2 from cancer of the breast.

"The results of this investigation are in entire conformity to an earlier enquiry, upon which I reported in some detail in my work on *The Mortality from Cancer throughout the World* (page 151, *et seq.*), and in which I gave the returns for an Indian population of 52,000 full-bloods and about 10,000 mixed bloods, among whom, according to reporting physicians, there had occurred only 2 deaths from cancer during the year under observation. The conclusion also has the support of the investigations of Dr. Levin, published in the *Studies of Cancer and Allied Subjects of the George Crocker Special Research Fund,* and of the investigations of Dr. Hrdlicka, who, on the basis of an extended study, remarks that 'Malignant diseases, if they exist at all—that they do would be difficult to doubt—must be extremely rare.'

"The foregoing observations have been emphasized by personal investigations among Indians of Bolivia, among whom I was unable to trace a single authentic case of malignant disease. All of the physicians whom I interviewed on the subject were emphatically of the opinion that cancer of the breast among Indian women was never met with. Similar investigations of mine among the Navajo and Zuni Indians of Arizona and New Mexico have yielded identical results. Hence the conclusion, supported by a large amount of additional evidence for primitive people throughout the world, that malignant diseases, among native races are of extremely rare occurrence."

A most interesting and most important investigation into the prevalence of cancer among the North American Indians, briefly alluded to by Dr. Hoffman, was undertaken by Dr. Isaac Levin, of the Department of Pathology of Columbia University, at the College of Physicians and Surgeons. His investigation was made at the expense of the George Crocker Special Research Fund, and it will

be found reprinted in the George Crocker publications of 1910 and in the *Zeitschrift für Krebsforschung* of the same year. Dr. Levin secured the co-operation of a large number of doctors practising among the Red Indians, and caused them to fill up detailed enquiry forms.

The result is tabulated in a most important statistical statement, from which we learn that Dr. Chas. M. Buchanan, who practised for 15 years among 2,000 Indians who, on an average, had a length of life of 55 or 60 years, noticed in all this time only one cancer case. Dr. Henry E. Goodrich, practising for 13 years among 3,500 Indians, saw not a single cancer case. Dr. L. M. Hardin, practising for 16 years among 10,000 Indians, met not a single cancer case. Dr. Mary H. McKee, practising for 18 years among 1,200 Indians, saw only a single cancer case. Dr. A. P. Meriwether, practising for 9 years among 8,600 Indians, had no cancer cases at all, and so had Dr. L. A. Parkinson, who practised for 8 years among 5,000 Indians. Dr. E. O. Sears, practising for 23 years among 1,200 Indians, had no cancer cases, nor had Dr. F. Shoemaker, who worked during 13 years among 3,400 Indians. Dr. J. F. Turner, who during 16 years practised among 2,500 Indians, saw not a single cancer case, etc., etc.

After giving a lengthy table from which I have extracted some of the more interesting figures, the author stated, commenting upon his table:—

"The analysis of this table shows a population of 115,455, which very nearly corresponds with the recorded Indian population, and during a time of practice ranging

from a few months to over 20 years, only 29 cases of cancer were encountered. In other words, cancer is extremely rare among the Indians as compared with the whites of the same locality, since, according to the twelfth census, cancer is just as frequent among the whites of the States in which the Indian Reservations are located, as in other States.

"This fact of the extremely rare occurrence of cancer among the American Indians must be considered as established, since it is impossible to suppose that many cases of deaths from cancer could have escaped the notice of the Government physician.

"Thus the conclusion must be reached, that while it may be true that cancer prevails among all the races of mankind, it is also true that the American Indians living under the same geographical and climatic conditions as their white neighbours, may be actually nearly immune from the disease. . . .

"It is very interesting in this connection, and also in connection with the hypothesis that cancer is a function of age, to read the following abstract from Dr. Ales Hrdlicka's *Physiological and Medical Observations among the Indians,* etc.:

" 'The proportion of nonagenarians, and especially centenarians, among the Indians is far in excess of that among native white Americans. It may be objected that the sources of error are apt to be greater among the Indians in such cases, and that the low ratio for males between 80 and 90 years of age may signify that some individuals of this group were classed as older, but the objection is not so serious as might be anticipated on account of the marked general interest centering about the oldest in every tribe; at all events, no ordinary error could account for the extreme disproportion of centenarians observed, viz., 224 per million of Indians to 3 per million of whites. The relative excess of aged persons (80 years and above) among the Indians can signify only that the infirmities and diseases known ordinarily as those of old age are less grave

among them—a conclusion in harmony with general observation.'

"Thus the difference in age cannot account for the rare occurrence of cancer among Indians. Climatic differences are frequently considered of importance in the occurrence of cancer, and Dr. Sodre, writing about cancer in Brazil, claims that the rare occurrence of the disease in that country is due to its tropical situation. The climate cannot play any rôle among the American Indians of the United States, since the reservations are situated in different states, south, north, east, and west; and, furthermore, cancer is prevalent among the whites of the same localities."

Quite recently, on the 29th July, 1922, the *Journal of the American Medical Association* printed a challenging letter to the editor, worded as follows:—

"Do American Indians have Cancer?

"To the Editor.

"In the Journal, July 8th, Dr. Joseph Rilus Eastman discusses interestingly the subject of malignant growths. I wish, however, to comment on his statement that our American Indians do not have cancer. Here, in the southwest, I have known fairly well one tribe of Indians. They number about 500. During my residence of 3 years among them, 3 full-blood Indian men died of cancer, respectively, of the lips and mouth, of the throat, and of the penis. For the last 18 months at Tucson I have had charge of another group of about 500 Indians. During this time, one of them, a woman of pure Indian extraction, died of cancer which destroyed the right orbit and adjacent tissues. It seems to be the custom not to perform necropsies on Indians, and I believe that few, if any, have been performed. If any considerable number of necropsies

were performed, perhaps there would be disclosed occasionally a deep-seated cancer.

"C. G. ANDREWS, M.D., Tucson, Ariz."

The information given with regard to the Red Indians of North America should convince even the most sceptical that that interesting race is almost free from cancer. The negligibly few cases that have occurred, such as those mentioned by Dr. Andrews, are most likely ascribable to the growing contact of the Red Indians with Western civilization, for the American Indians are to an increasing extent becoming shopkeepers, railway workers and factory workers, are intermarrying with whites and are adopting Western habits of life, Western food, etc.

The South American Indians also seem practically free from cancer. Dr. F. L. Hoffman made a special investigation quite recently and communicated its results to Sir W. Arbuthnot Lane in a letter which is reprinted in his pamphlet *Chronic Intestinal Stasis and Cancer,* which was published in London in 1923. Dr. Hoffman wrote:—

"Your views regarding dietary or nutritional causation (of cancer) coincide with my own, based upon extensive research among native races. I recently returned from a trip to South America, where I lived for seven months among native Indians and mixed bloods. During the entire period, not a single case of cancer was brought to my attention, although everywhere I enquired, although every doctor was asked the question, and although I personally came into contact with more than 2,000 natives. The diet is very simple, and the habits of the people are very regular."

Having considered the position among the North and South American Indians, let us turn to the African negroes.

The *British Medical Journal* of the 7th July, 1923, contained the following striking letter from Dr. Bernard Hollander:—

"Freedom of Negro Races from Cancer

"Thirty years ago I was interested in the causation of cancer, when my friend, the late Sir Henry Morton Stanley, the African explorer, drew my attention to the fact he had observed, that the native races in the regions through which he had travelled were free from it. To make sure, he furnished me with a list of hospitals and got me to write to the physicians in charge of them. The replies I received confirmed his observation and revealed that only in coast towns, where natives mingled with Europeans, did cancer occur, and then only (at that time) one case in about 10 or 12 years.

"This information led me to further enquiries, and I ascertained that native races of other continents were similarly immune when not brought in contact with civilization. I also noted the belief of several of my correspondents that it was the vegetarian diet of the natives which accounted for the exemption.

"(London, W. 1, June 29th). Bernard Hollander."

The observation of the writer that "only in coast towns where natives mingled with Europeans did cancer occur, and then only, at that time, one case in about 10 or 12 years," is most impressive.

In another letter to the editor, which appeared in the *British Medical Journal* of the 30th June, 1923, a well-known medical man affirmed that he "never

saw a single case of gastric or duodenal ulcer, colitis, appendicitis, or cancer in any form in a native, although these diseases were frequently seen among the white or European population." His letter ran as follows:—

"For 6½ years I was District Surgeon in the Orange Free State. The district in which I practised had a native population of 14,000, and the great majority of the Banser race. During the whole of that period I never saw a single case of gastric or duodenal ulcer, colitis, appendicitis, or cancer in any form in a native, although these diseases were frequently seen among the white or European population. These facts are well known to all medical men in South Africa who have practised among the native races.

"P. P. FOUCHE."

The *British Medical Journal* of 1906 contains on page 1562 a valuable statement on cancer among the natives, written by Dr. H. Hearsey, the Principal Medical Officer, British Central Africa. Under the heading, "The Rarity of Cancer among the Aborigines of British Central Africa," we read:—

"There can be little doubt but that cancer as a disease affecting natives of British Central Africa is of the utmost rarity. Enquiries from medical men of lengthened residence in the country, and who have been in constant touch with natives, have elicited replies confirming this statement. Repeated efforts made by Government medical officers throughout the country for some time past have so far resulted in the discovery of but two cases, and a third provisionally so diagnosed.

"Cancer of the breast has not yet been met with, and not a single case has been recorded by medical men attached to the various missions and who have been in the closest touch with natives for many years. The question natur-

ally arises, What is the cause of this extreme rarity of cancer among Aborigines?—for the rarity is undoubtedly obvious.

"It should be stated at the outset that, so far as non-malignant growths are concerned, natives of this country furnish examples of several kinds of growths. Thus cystic tumours are not uncommon; tumours composed of fully connective tissue, such as fibroma, lipoma, enchondroma, and bony exostosis, are frequently observed; tumours consisting of complex tissues furnish examples in the cases of nævus, lymphangioma, lymphadenoma, occasionally met with; tumours composed of embryonic tissues are rare, and so far only one case of doubtful sarcoma has been reported.

"It would therefore follow that the main etiological factors connected with the production of morbid growths, namely, heredity, local irritation, mechanical injury, must all be present. How comes it, then, that these causes, which also operate to produce carcinoma, fail in the case of Aborigines to produce this growth? . . . It would be of interest to endeavour to ascertain how it comes about that native women in this country are practically immune from cancer of the breast. . . . Those who have resided in this country for any length of time will, I think, agree with me, that although it may be stated in a general way that natives fail to attain extreme old age, yet that there are ample instances of natives reaching the age of from 40 to 50 years, sufficient at any rate to negative the statement that natives are exempt from cancer because they do not live to attain the age at which cancer is most frequent."

In an address on "Intestinal Stasis," Sir Arbuthnot Lane stated:—

"It is interesting to note that savages do not suffer from indigestion, appendicitis, duodenal or gastric ulcer, colitis, or cancer in their normal surroundings, but when

placed in civilized conditions they acquire these diseases as readily as white people."

That statement of his is most impressively confirmed by a very long report of Dr. W. Renner, Medical Officer, Freetown, Sierra Leone, which was published in the *British Medical Journal* of the 31st September, 1910, under the heading, "The Spread of Cancer among the Descendants of the Liberated Africans or Creoles of Sierra Leone." It runs as follows:—

"I have been rather struck within recent years by the increasing number of cases of cancer of various organs, especially of the breast, that have, in the course of my practice, come under my observation, and this particularly so among the descendants of the liberated Africans, commonly called Creoles, who form the bulk and principal portion of the colony proper.

"In consequence of this, I have been induced again to look into the return of cases admitted into the Colonial Hospital as well as into my private case book, to see how far I would be justified in speaking of an increase of this disease among the Creoles, its apparent rarity among the resident Aborigines in the colony and in the hinterland of Sierra Leone, and how far this apparent increase is due to causes which may be traced to the influences of European civilization and the adoption of the European mode of living.

"In pursuing the investigation of this subject, I would first consider the case of the resident Aborigines in the colony and in the hinterland. From the fact that this disease is rarely seen or met with among the hundreds of female Aborigines who are treated regularly every year in the Colonial Hospital, and that medical officers of the Protectorate districts, especially those who are stationed in large towns where there are established dispensaries

at which the natives have been encouraged to attend for treatment, have, in their official returns, not shown the presence of new growths among their patients, we can safely assume that cancer, as a disease, is very rare among the Aborigines. This is, however, only fairly, but not altogether, satisfactory, as there may be cases which are kept in the background by the people, and which, even when on his patrols in the district, the medical officer cannot get hold of. Therefore, in respect of the non-entry of cases of cancer in the official returns, I would rather not say that the Aborigines are immune from the disease, but that the disease is rare among them.

"With reference to the Creoles in the colony proper, any examination of the records of hospital cases and those of medical practitioners would show that within the last 40 years cancer as a disease has been spread among them.

"The incidence of cancer and other malignant growths among the Creoles and its absence, or rarity, among the Aborigines are due, in my opinion, to the habits of, and the civilizing influences operating upon, the former, and to the primitive mode of living of the latter.

"The Creoles have adopted the mode of living, the food, and dress of the Europeans—have to a great extent discarded the simple food of their forefathers, have been craving for, and indulging in, preserved and imported foreign food—have substituted the European for the natural African environment and entailed on themselves in their eager pursuit for wealth and luxury the anxieties and worries incidental to civilization and consequent liability to premature decline.

"Reverting to the question of food, while the Creoles in a tropical country like Sierra Leone consume a large quantity of meat which is absolutely unnecessary, the Aborigines—the Timnes, the Mendis, Kurankos, and others —confine themselves mostly to grain and vegetables, which really should form the bulk of the dietary of the natives in the tropics, and eat little of meat or flesh, with the result that the latter are, on the whole, healthier, and are free

from the tendency to engender and propagate foreign diseases.

"On the question of the relation of diet to diseases, some medical authorities have asserted that butcher's meat is undoubtedly one of the means by which cancer is propagated. Although I cannot yet, for want of sufficient data, absolutely accept this theory, yet the fact that cancerous growths are common among well-to-do Creoles, who can with ease afford meat and other articles of European dietary, strongly appeals to me as lending a support to that theory.

"Epitheliomatous growths are very rare among both Creoles and Aborigines. By this, I mean epithelioma of the lip, tongue, cheek, etc., such as have been met with among the negroes and the West Indian Islands, the South States of North America and in India, and are considered to be the result of local irritation. This rarity is possibly due to the fact that the Creoles are not great smokers of clay pipes, and are, to a large extent, the possessors of good teeth. I have, however, noticed a marked tendency to degeneration of the teeth among all classes from children upwards—a condition which was certainly absent 25 years ago, and which I put down to the use of European articles of diet, as saccharine foods, preserves, and sweets. If this tendency is not checked, I would not be surprised if in another 50 years epithelioma of the tongue should become as common a disease as cancer of the breast in this colony.

"But in the Aborigines, also, there is a marked absence of these epitheliomatous growths, and yet both men and women, and even children, are great clay-pipe smokers. Their teeth are, however, kept beautifully, and are pearly white, and that tendency to decay which has been noticed in the Creoles is entirely absent in them."

Dr. Renner confirms the various opinions in this chapter that the civilized and Westernized natives contract cancer, while the natives who live in native

fashion are entirely, or nearly entirely, free from the scourge.

The *British Medical Journal* of the 21st July, 1923, printed the following letter relating to cancer among the negroes in Nigeria:—

"Freedom of the Negro Races from Cancer.

"Sir,—One of the most lively impressions present to the mind of the medical worker in Nigeria after 2 or 3 years of routine work among the people is the apparent rarity of carcinoma. Personally, I have been looking out for it on the spot for some 22 years, and my experience resembles that of my colleague, Dr. Dyer Sharp; I have never seen a case of carcinoma nor of sarcoma. Some of the medical men in the coastal regions of Nigeria encounter carcinoma occasionally, but chiefly among natives who have been in contact with the European, some of whose dietetic and other domestic practices they have copied, indulging, for example, in the consumption of tinned stuffs, and not impeccable tinned stuffs always; when they encounter it among indigenous natives from the interior it will generally be found that these are more or less exiles, and almost inevitably denationalized to a greater or less degree.

"M. Cameron Blair,
"West African Medical Staff."

Dr. Robert Bell stated on page 37 of his book, *The Cancer Scourge,* London, 1923, referring to Egypt:—

"When I was in Egypt some years ago, I made the acquaintance of Professor Madden, who had given considerable attention to the subject of cancer in so far as its prevalence in Egypt in particular is concerned. He stated that cancer is never found in male or female amongst the black races of that country. These include the Ber-

berenes and Sudanese, who are all Mussulmans, and live almost entirely on a vegetable diet. Cancer, however, is fairly common amongst the Arabs and Copts, who form a large portion of the white population of Egypt, and who live and eat much more like Europeans, thus clearly demonstrating what an important effect diet has upon this disease."

I have been told that Professor Madden, his authority, is a very eminent and reliable witness.

Concerning Cape Colony, the *British Medical Journal* of the 29th September, 1923, contained a letter from Dr. J. R. Love, written from Staplehurst, Kent, which ran as follows:—

"I practised in Cape Province, South Africa, for 14 years (1901-15), and during that time I do not remember having seen a case of cancer among the natives. Another fact which struck me was that the natives do not suffer from carious teeth. If a native does happen to get toothache, he will trudge to the nearest dentist or doctor, perhaps 30 miles away, to have it extracted."

From the islands of Australasia we also learn that cancer is practically unknown among the natives, but that it occurs in natives who have adopted European ways of life. The third report of the British Imperial Cancer Research Fund gives, on pages 30 and 40, the following most valuable particulars:—

"Sir William Macgregor, who was for nearly 10 years Governor of British New Guinea, in an address delivered at the London School of Tropical Medicine, said:

" 'For 9½ years I never saw a case of cancer in British

New Guinea, but at the end of that time there occurred an example of encephaloid cancer of the tibia in the person of a Papuan that had for 7 or 8 years lived practically a European life, eating tinned Australian meat daily.'

"New growths, whether benign or malignant, are rare both among the inhabitants of New Guinea and the closely related Melanesians of the Bismarck Archipelago and the Northern Solomons. . . .

"Papuasians and the Melanesians of the Bismarck Archipelago and the Northern Solomons are predominantly vegetable feeders, and do not suffer from gout and arteriosclerosis; but their immunity to new growths cannot be directly attributed to their diet, since in Australia, where the natives make no gardens and are largely hunters, tumours, whether benign or malignant, are certainly rare, and are perhaps as infrequent as among the Melanesians.

"In those rare cases of malignant disease which occur among the Melanesians, the incidence of the disease seems to be associated in some obscure way with the adoption of a mode of life which assimilates to that of the white man."

Turning to British India, we find once more that cancer is practically unknown, or quite unknown, among the native races who lead a native life, while that disease and certain concomitant diseases and defects are quite common among the Westernized natives. Colonel Robert McCarrison is one of the most eminent medical investigators living. His experimental researches into the causation of goitre and into food deficiencies and the diseases springing from them are of the utmost value. He had described them in very important books. In an address on "Faulty Food in Relation to Gastro-Intestinal Disorder," delivered late in 1921 in the

United States, and reported in the British *Lancet* of the 4th February, 1922, and in the *Journal of the American Medical Association,* Dr. McCarrison made the following most impressive statement:—

"For some 9 years of my professional life my duties lay in a remote part of the Himalayas, amongst isolated races far removed from the refinements of civilization. Certain of these races are of magnificent physique, preserving until late in life the characters of youth; they are unusually fertile and long-lived and endowed with nervous systems of notable stability. . . .

"During the period of my association with these peoples, I never saw a case of asthenic dyspepsia, of gastric or duodenal ulcer, of appendicitis, of mucous colitis, or of cancer, although my operating list averaged over 400 operations a year. While I cannot aver that all these maladies were quite unknown, I have the strongest reason for the assertion that they were remarkably infrequent. The occasions on which my attention was directed to the abdominal viscera of these people were of the rarest. I can, as I write, recall most of them—occasions when my assistance was called for in the relief of strangulated hernias, or to expel the ubiquitous parasite—*Ascaris lumbricoides.* Amongst these people the abdomen, oversensitive to nerve impressions, to fatigue, anxiety, or cold, was unknown. Their consciousness of this part of their anatomy was, as a rule, related solely to the sensation of hunger."

Sir W. Arbuthnot Lane showed me the following letter which he had received from a highly qualified Parsee, relating to Indian natives in Europeanized Bombay and in the primitive interior:—

"Etawat, Northern India,
"30*th November*, 1923.

"Dear Sir Arbuthnot Lane,—

"I have read with great interest and pleasure your address on 'Chronic Intestinal Stasis and Cancer,' delivered before the Guy's Hospital Physical Society and published in the *British Medical Journal* of October 27th, 1923.

"I am a Bombay man, what you would call 'a civilized being,' a member of the small but more socially and intellectually advanced community, the Parsees. I have come here for a short change. We, in Bombay, especially the Parsees, always suffer from dyspepsia, constipation, and other ills which modern civilization and hurry and scurry of modern city life entail. What I find here is that the populace, which is more rural than urban, eat plenty of freshly ground corn, especially millet, fresh vegetables, such as lettuce and radishes, and fresh and unadulterated milk and its products. I am informed by my host, who has lived here for more than 20 years, that there is hardly any serious bowel complaint here—on the contrary, there may be diarrhœa on festive occasions—and no cancer whatsoever. Further, almost all natives have the salubrious habit of walking out into the open fields or fallow land twice a day regularly to have their bowels moved, whether inclined or not. This, he says, is a greatly beneficial habit, and keeps the populace quite healthy and free from any bowel complaint.

"Since coming here, I myself find it necessary to use the privy seat twice a day, a custom more akin to Nature than the constipated one in the city of Bombay.

"I have written this, thinking it might interest you. Wishing you a happy Christmas and many happy returns of the same,

"Yours truly,
"F. D. Bana, M.B., M.R.C.S., D.P.H.,
"87, Lamington Road, etc., etc.
"Bombay."

From a table given at the end of the next chapter, it will be seen that the cancer death-rate in civilized nations comes on an average to about 100 per 100,000 population. There are, of course, no reliable statistics relating to primitive races. However, there are some most interesting and most important figures regarding the Chinese in Hong-Kong, with which Dr. Hoffman has kindly supplied me. During the 10 years 1911-20, population and cancer death-rate among the Chinese of Hong-Kong were as follows:—

	Chinese Population	Cancer Deaths Among the Chinese	Death-rate per 100,000 Population
1911	354,790	36	10.1
1912	446,614	37	8.3
1913	467,644	46	9.8
1914	480,594	29	6.1
1915	495,840	38	7.7
1916	515,620	42	8.1
1917	521,600	45	8.6
1918	548,000	57	10.4
1919	584,500	46	8.5
1920	634,150	73	11.5

The Hong-Kong statistics are supposed to be reliable. They show that among the Chinese in Hong-Kong the cancer mortality is only about one-tenth as great as it is in the leading Western nations. This is all the more surprising as the Hong-Kong Chinese have become largely Europeanized. They live to some considerable extent like Europeans on

imported white flour, imported preserved meat, etc.

I think the evidence showing that primitive races are entirely, or almost entirely, free from cancer, which I have supplied in these pages, is absolutely overwhelming. It should convince the most unbelieving Thomas amongst my professional and unprofessional readers. However, it seems only fair to point out that the professional research workers have taken pains to discover cancer cases among native races, and naturally they have discovered isolated cases here and there. Summarizing the evidence, showing that cancer exists among natives, Dr. W. S. Bainbridge wrote in his book, *The Cancer Problem,* published in 1914, on pages 62 and 69:—

"The Imperial Cancer Research Fund, 11th Report, has called attention to the work of the German Imperial Colonial Office, as reported by the German Cancer Committee, from Samoa, German East Africa, German West Africa, and the South Sea Islands. Report on the material thus forwarded states that carcinoma is by no means rare, as is generally supposed, in these countries. The relative frequency, it is stated, cannot be determined, but 'it is certain that no new growth occurs in Germany which is not also found in the natives of the Tropics, and no new growth occurs in the Tropics which is not found in Germany.' . . . The apparent rarity of malignant new growths is to be explained by the fact that the natives with such tumours do not go to the hospitals, but avoid them and die unknown, and this is particularly the case for internal tumours.

" 'This agreement,' comments Bashford, 'in the results obtained independently through the investigations of the German Imperial Colonial Office and the Foreign, India, and Colonial Offices of this country, should go far to dis-

sipate any lingering belief that European habits of life are primarily responsible for the occurrence of cancer.'

"Extended study of the geographical and ethnological distribution of the disease tends more and more to show that no country, no district, no race, no nation, may be considered as possessing immunity. The supposed freedom of savage and semi-civilized races is accounted for, at any rate in part, by the relatively small number of these individuals who have been examined, by age incidence, and by other factors not concerned with geographical and ethnological questions. . . .

"The investigations of the Imperial Cancer Research Fund have shown that the disease occurs among all races of mankind—among those not living in close contact with civilization as well as among those that are. Exemption is not conferred by any of the many diverse conditions of life found among widely separated and primitive aboriginal races."

I think the evidence showing that primitive races have little or no cancer is infinitely stronger than the somewhat lame assertions to the contrary made by certain professional research workers, assertions which, as a rule, are based on a few isolated occurrences, probably among Europeanized natives, or which relate, not to cancer proper, but to sarcoma.

There is, of course, one form of cancer which is fairly frequent among the hillmen of Northern India. This is Kangri cancer, an anomalous cancer of the skin of the abdomen and the thighs which occurs among the natives of Kashmir. It is caused by the so-called Kangri basket, a small earthenware vessel surrounded by basket-work which contains burning charcoal, and which the natives carry in cold weather suspended next to the skin in order to

warm themselves. Often repeated burns of the abdomen and thighs lead to cancerous developments in that part of the body which, as a rule, is not a cancer site in other countries.

The fact that cancer is indeed a disease of civilization may also be seen by this, that men suffer far more from tumours, both malignant and non-malignant, than do animals. De Quervain stated in his book on tumours, published in Leipzig, in 1913:—

"Among all living beings, man stands foremost with regard to the number and variety of tumours, probably because, in his case, deviation from the natural method of living has been carried to the furthest extent."

That significant statement is confirmed by the cancer incidence among animals. Bainbridge rightly states on page 50 of his book, in considering cancer among animals, that "among domesticated animals, dogs seem to lead in point of frequency in occurrence of cancer." Cancer is comparatively rare among working dogs who lead a more or less natural life. It is most frequent among pet-dogs who share our houses and our food. W. Roger Williams stated on page 95 of his book, *The Natural History of Cancer,* London, 1908:—

"Of all domesticated animals, dogs are by far the most prone to malignant tumours. . . .

"Cancer is even more prevalent among dogs than among human beings. All the chief types and varieties of cancer met with in mankind also prevail among dogs. . . .

"Most of the affected animals are domestic pets."

Dr. Jacob Wolff told us in his huge work on cancer, *Die Lehre von der Krebskrankheit*: "The dog is notorious for being subject to all the tumours which afflict man, and in the case of dogs the percentage of malignant tumours is particularly high."

I think I have shown convincingly that tumour is indeed a product of civilization. Cancer has been a product of civilization since the time of the Greeks, Persians, and Romans. Before enquiring into the causes which bring about cancer in civilized life, I would like to devote a chapter to investigating whether cancer in civilized communities is really increasing at a most alarming rate, as some maintain, or whether, as other cancer experts have asserted, that increase is imaginary and is due to the faultiness of statistics, to the increasing accuracy of death certificates, and various other causes. When the ground has thus been cleared, the causation of cancer will be fully considered.

CHAPTER IV

The Rapid Increase of the Cancer Mortality throughout the World

The first task of a man who wishes to erect a building consists in clearing the ground. The first task of a man who wishes to advance a new theory relating to the causation of cancer consists in dealing with the existing doctrines which he wishes to refute and with those arguments which might seem to disprove his doctrine.

In the first chapter I have dealt with the horror and the mystery of cancer, and have shown the urgency of dealing with the problem. In the second chapter I have shown that science has failed in finding a solution, and that many leading experts believe that the problem is insoluble. The third chapter was devoted to overwhelming evidence showing that cancer experts were quite unjustified in asserting that the disease is a "natural and inevitable" infliction, and that it strikes alike rich and poor, civilized and uncivilized peoples, mammals, birds, fishes, and trees. The question to be considered is not cancer in animals and in trees, but in men. I have brought overwhelming evidence showing that cancer is a disease of civilization, and that it is practically unknown among primitive peoples.

A great many medical and non-medical statisticians have demonstrated with considerable ingenuity that the increase of cancer among civilized nations is rather apparent than real. They have told us that there is no reason for alarm, that there has always been a great deal of cancer about, that the apparent increase is solely due to more careful post-mortem examinations on the one hand and to greater longevity of men on the other hand. They say that in past years cancer deaths were frequently described in death certificates as deaths from senile decay and various other causes, and that the great advance in hygiene causes a much larger percentage of men and women to reach the cancer age than they did in the past. These assertions seem very plausible. Therefore I wish to disprove them in the following pages.

The medical statistics of England and Wales are considered to be exceedingly reliable. An excellent medical organization has constantly improved the compilation of the British mortality statistics, and a large body of conscientious practitioners are exercising every care to issue correct death certificates. In the report *On the State of the Public Health,* published by the British Ministry of Health in 1923, we find on page 13 the table shown on page 76.

Commenting on these truly terrible figures, the Government Report mentioned informs us:—

"From these figures it will be seen that the death-rate from cancer is now more than seven times what it was in 1838."

DEATHS PER MILLION FROM CANCER IN ENGLAND AND WALES

1838–42	173	1898	799
1847–50	274	1899	826
1851–55	306	1900	829
1856–60	327	1901	842
1861–65	367	1902	846
1866–70	403	1903	874
1871–75	445	1904	879
1876–80	494	1905	889
1881	520	1906	922
1882	534	1907	915
1883	549	1908	931
1884	563	1909	962
1885	572	1910	967
1886	590	1911	992
1887	615	1912	1,023
1888	621	1913	1,064
1889	656	1914	1,069
1890	676	1915	1,121
1891	692	1916	1,166
1892	690	1917	1,210
1893	710	1918	1,218
1894	712	1919	1,145
1895	753	1920	1,161
1896	762	1921	1,215
1897	785	1922	1,229

The criticism that the increase in the cancer mortality is more apparent than real is dealt with on page 21, where we read:—

"The result of an application to the extensive data available in England and Wales would appear to confirm the popular impression that the *recorded increase of mortality from cancer is not a statistical fiction, but an established fact.* It does not, of course, follow that the *whole* of the recorded increase since 1851-60 is a real one."

On page 24 of the same document we read the despondent phrase:—

"The facts set out above make melancholy reading, and seem to suggest that the prospects of a 'conquest,' or even a substantial reduction of cancer, are remote."

If doctors make mistakes in ascribing cancer deaths to some other cause, they may also attribute deaths from tuberculosis of the respiratory system to something else. The Report mentioned gives on page 184 the death-rate from tuberculosis of the respiratory system per million. The death-rate per million from what is usually called pulmonary consumption has declined as follows in England and Wales:—

1847	3,189	1890	1,748
1850	2,702	1900	1,337
1860	2,652	1910	988
1870	2,526	1920	843
1880	1,962	1922	855

Doctors filling up death certificates may be careless, particularly in the case of poor people living in remote districts, who often call in a doctor only when the patient is dying or dead. They may mistake death from internal cancer for something else. However, they will not easily make mistakes in the case of external cancer. They cannot easily ascribe in their certificates death from cancer of the breast, from cancer of the skin, or from cancer of the mouth and the tongue, to apoplexy, inflammation of the stomach, etc. According to the 1923 Report of the Registrar-General, the mortality from all diseases, and from cancer of the buccal cavity, breast, and skin, was as follows in the years 1912-22:—

MORTALITY IN ENGLAND AND WALES

	Total Deaths (from all Diseases)	Buccal Cavity		Cancer Deaths. Breast		Skin	
		Males	Females	Males	Females	Males	Females
1912	486,939	2,042	317	20	3,736	560	361
1913	504,975	2,144	327	22	3,852	571	313
1914	516,742	2,093	347	37	3,800	605	350
1915	562,253	2,110	353	34	3,920	611	392
1916	508,217	2,216	370	28	4,131	644	365
1917	498,922	2,293	402	39	4,185	640	392
1918	611,861	2,357	377	37	4,082	647	392
1919	504,203	2,387	378	28	4,309	714	416
1920	466,130	2,449	369	35	4,488	702	385
1921	458,629	2,482	358	33	4,684	719	401
1922	486,780	2,415	361	42	4,826	627	439

In 1922 the number of all deaths was practically equal to the number of deaths in 1912. However, during the period under review, the deaths from cancer of the buccal cavity increased by 20 per cent. in the case of males and females. As regards deaths from cancer of the breast, the number of female deaths increased by 30 per cent., while that of male deaths doubled. As regards deaths from cancer of the skin, there was an increase of 30 per cent. in the case of both males and females.

Per million living, the death-rate from cancer of the mouth and tongue, from breast cancer, and from skin cancer, increased as follows:—

	Cancer of Buccal Cavity	Breast	Skin
1912	65	103	25
1913	68	106	24
1914	66	104	26
1915	69	112	28
1916	74	120	29
1917	79	125	30
1918	81	123	31
1919	75	118	31
1920	75	120	29
1921	75	125	30
1922	73	128	31

Allowing for the increase in population, there was an increase in the various forms of outward cancer which was very considerable and very striking. That increase is particularly significant if we remember that the medical organization and the technique of operations have been vastly improved during the period under consideration. As operation for outward cancer is frequently successful, the death-rate from cancer of the buccal cavity, breast, and skin ought to have diminished very materially, instead of which it has increased in a very significant manner.

Cancer of the tongue, which now claims every year a considerable number of victims in England and elsewhere, was formerly almost unknown. That eminent surgeon, Sir D'Arcy Power, delivered some years ago a lecture on cancer of the tongue before the Royal College of Surgeons of England, an abstract of which will be found on page 37 of the

British Medical Journal for 1919. Surveying the position, Sir D'Arcy Power stated:—

"Cancer of the tongue is remarkable in the fact that it is almost entirely a human disease; it is always of one type; it is unknown in children; it is common in men, rare in women; it is not associated with any inherited predisposition to carcinoma.

"Cancer of the tongue did not become important surgically until the seventeenth century. The Greek, Latin, and Arabian writers on surgery hardly mention it, and so far as can be ascertained at present, it was unknown to the Anglo-Saxons. . . .

"The zoological distribution of lingual carcinoma was considered in the light of the experience of Sir John McFadyean, Principal of the Royal Veterinary College; of Dr. J. A. Murray, Director of the Imperial Cancer Research Fund; and of Dr. Anton Sticker. At the present time, cancer of the tongue is known to have occurred in one horse, three cats, and one dog. All these animals were aged, and in each the cancer was of the squamous-celled variety.

"It appears fair to assume, therefore, that lingual carcinoma has always occurred in men and domestic animals; that originally in man it was no more frequent than it now is in animals; but that from the seventeenth century onwards it has increased out of all proportion in man, whilst the incidence has remained stationary in animals.

"The rate at which cancer of the tongue has increased in man is well shown in the returns of the Registrar-General. Dr. Stevenson, Superintendent of Statistics, wrote in 1909:

" 'The increase amongst males of deaths from cancer of the jaw, and especially of the tongue, is remarkable, and can scarcely be explained by improved diagnosis. Although cancer of the tongue presents little difficulty of diagnosis in its later stages, the recorded mortality has increased

amongst males by no less than 228 per cent. in 41 years. The increase, moreover, is entirely confined to the male sex.' ''

The concluding paragraph, which tells us that during the 41 years preceding 1909 the mortality from cancer of the tongue in England and Wales "has increased amongst males by no less than 228 per cent.," is highly significant, and shows clearly that the increase of the general cancer death-rate is not imaginary, but is terribly real.

On the 14th August, 1923, the British Ministry of Health sent a printed circular on cancer to the local authorities which confirms the ghastly increase in deaths from visible cancers, for we read on page 4:—

"It has long been matter for discussion to what extent this increase of cancer has been due to improved diagnosis and more accurate certification of cause of death. There can be little doubt that these factors have been contributory, but unfortunately it has now to be recognized that they will not account for the whole of the recorded increase. Superficial cancers, such as those of the tongue or the female breast, were readily recognizable as such even 60 years ago, by the time death occurred. Yet in the 20 years' period 1901-21 (after making allowances for the ageing of the population) the mortality of males ascribed to cancer of the tongue has increased from 38 per million living in 1901 to 53 in 1921, and that of females from cancer of the breast from 148 in 1901 to 190 in 1921, increases of 39 and 28 per cent. respectively in 20 years. During the same period the mortality, similarly stated, of the total population from all forms of cancer, increased from 841 per million in 1901 to 1,007 in 1921, or by 20 per cent."

In England and Wales the increase in the cancer death-rate is obviously terribly real. It certainly is not a statistical fiction.

In the opinion of many, the Scotch mortality statistics are more reliable than the English. Scotchmen are known for their accuracy and conscientiousness. The annual report of the Registrar-General for Scotland, published in 1923, shows the following changes in deaths from cancer, tubercular disease, and consumption:—

MORTALTY IN SCOTLAND FROM—

	Cancer	All Tubercular Disease	Phthisis
1901	3,662	9,911	6,776
1902	3,711	9,536	6,572
1903	3,798	9,726	6,630
1904	3,920	10,158	6,738
1905	4,132	9,619	6,374
1906	4,509	9,999	6,491
1907	4,551	10,070	6,415
1908	4,611	9,462	6,079
1909	4,782	9,274	6,000
1910	4,863	8,517	5,409
1911	4,948	8,387	5,451
1912	5,195	8,149	5,306
1913	5,212	8,005	5,103
1914	5,388	7,696	4,917
1915	5,291	7,819	5,291
1916	5,431	7,672	5,126
1917	5,554	7,625	5,073
1918	5,472	7,700	5,217
1919	5,657	6,326	4,294
1920	5,765	6,042	4,194
1921	5,962	5,737	3,946
1922	6,133	5,818	4,041

In the short space 1901-22, the number of deaths from cancer increased by 80 per cent., while the deaths from tubercular disease diminished by 30 per cent. In 1901, nearly twice as many Scotch people died from consumption as died from cancer. In 1922, 50 per cent. more Scotchmen died from cancer than from consumption. Commenting on these awful figures, the Report states on page 33:—

"Deaths from cancer and other forms of malignant disease numbered 6,133, and the corresponding death-rate is 125 per 100,000. Both this number and this rate are the highest yet recorded in Scotland. The deaths registered during the year from cancer numbered 171 more than in the previous year, 453 more than the mean of the numbers in the 5 preceding years, and 641 more than the mean of those of the preceding 10 years. The cancer death-rate of the year, 125 per 100,000, is 3 more than that of the previous year, 12 more than the mean of those of the 10 years 1911 to 1920, and 32 more than the mean of those of the 10 years 1901 to 1910.

"Previous to 1878, the cancer death-rate was constantly less than 50 per 100,000, in 1878 it was more than 50, in 1886 it rose to 60, in 1894 to more than 70, in 1898 to 80, in 1905 to over 90, in 1909 to over 100, in 1912 to 110, and in 1921 to over 120. The cancer deaths of the year are 5.3 times as many as those of 1861, 4.3 times as many as those of 1871, 3.2 times as many as those of 1881, 2.3 times as many as those of 1891, 1.7 times as many as those of 1901, and 1.2 times as many as those of 1911. Up to the year 1912, phthisis deaths constantly outnumbered cancer deaths, but since 1913 the reverse has been the case, the cancer deaths being the most numerous.

"Cancer deaths now outnumber phthisis deaths by 2,072, or by 33.3 per cent. Fifty years ago (in 1872) phthisis deaths outnumbered cancer deaths by 7,156, or by 82.1 per cent.

"Of the 6,133 deaths from cancer, 2,617 occurred among males and 3,516 among females, the male death-rate from this cause being 111 per 100,000 and the female 138. Compared with the previous year, the male death-rate shows an increase of 5, and the female an increase of 1.

"In the larger burghs, taken collectively, this death-rate was 133 per 100,000, in the smaller burghs 128, and in the country districts 112. In the previous year these three death-rates were 129, 127, and 108, and thus each shows an increase, the increase of the larger burgh rate being 4, of the smaller burgh rate 1, and of the country district rate 4. The age-group death-rates from cancer ranged from 1,257 at ages 85 and upwards, 1,101 at ages 75 to 84, 830 at ages 65 to 74, and 483 at ages 55 to 64, to less than 5 in all age-groups under age 24."

In the United States, where the registration of deaths is supposed to be effected with less care than in England, there has also been a rapid and continuous increase in the cancer mortality. Dr. F. L. Hoffman's excellent book, *The Mortality from Cancer throughout the World,* Newark, 1915, gives on page 422 the table on page 85, which the author has most kindly brought up to date.

Since 1913 the cancer death-rate in the United States has further advanced. Dr. Hoffman wrote in the *Boston Medical and Surgical Journal* of the 22nd February, 1923:—

"Thirty-eight cities had, at the end of the period, a total population of over 22,000,000, or about one-fifth of the entire population of the Continental United States. They may, therefore, be safely relied upon, as representative for the country at large.

"During the period of 1912–15 these cities had a cancer death-rate of 87.9 per hundred thousand population. Dur-

ESTIMATED MORTALITY FROM CANCER, CONTINENTAL UNITED STATES

	Estimated Number of Deaths from Cancer	Cancer Death-rate per 100,000 U. S. Registration Area
1900	47,829	62.9
1901	49,890	64.3
1902	51,542	65.1
1903	55,153	68.3
1904	57,794	70.2
1905	59,931	71.4
1906	59,155	69.1
1907	61,840	70.9
1908	63,494	71.5
1909	66,731	73.8
1910	70,099	76.2
1911	69,494	74.3
1912	73,282	77.0
1913	76,319	78.9
1914 Registration	52,420	79.6
1915 Area only	54,584	81.4
1916 " "	58,600	82.1
1917 " "	61,452	82.0
1918 " "	65,340	80.3
1919 " "	68,551	80.5
1920 " "	72,931	83.4
1921 " "	76,274	86.0
1922 " "	80,938	86.8

ing the next 5 years the rate increased to 95.4 per hundred thousand, and during 1921 to 101.5. . . .

"The mortality from cancer is now approximately 100,000 a year, equivalent to a rate of 100 per hundred thousand of population. The disease is increasing from year to year, in practically every state and in practically every community, for which the records are available and trustworthy. The increase in cancer is a fact, and not a statistical fallacy."

In the United States, as in England, mistakes in death certificates might be made in the case of invisible cancers, but such mistakes are not likely in the case of surface cancers. Dr. Hoffman gives on page 435 of his book the following remarkable figures:—

Estimated Total Mortality from Cancer, Continental United States

	Buccal Cavity	Female Breast	Skin
1900	1,224	3,455	1,485
1901	1,513	4,009	1,689
1902	1,444	4,287	1,700
1903	1,632	4,391	1,857
1904	1,820	4,988	1,872
1905	1,950	4,911	2,015
1906	1,918	4,935	2,005
1907	1,962	5,248	2,271
1908	2,178	5,735	2,432
1909	2,535	6,369	2,650
1910	2,691	6,371	2,492
1911	2,726	6,614	2,555
1912	2,894	6,860	2,735
1913	3,007	7,021	2,638
1914 Registration	2,270	5,335	1,957
1915 Area only	2,123	5,099	1,955
1916 " "	2,091	5,461	2,042
1917 " "	2,280	5,622	2,157
1918 " "	2,347	5,933	2,225
1919 " "	2,511	6,169	2,467
1920 " "	2,679	6,577	2,367
1921 " "	2,610	6,927	2,433
1922 " "	2,772	7,215	2,617

During the few years under consideration, deaths from visible cancer, which cannot easily be mis-

taken, have considerably more than doubled—a truly terrible record.

Apparently deaths from visible cancer are increasing far more rapidly in America than in England, and it is to be feared that we may conclude therefrom that the cancer death-rate is advancing far more rapidly in the United States than in the British Isles.

In a sparsely settled country like the United States, death registration is perhaps not very reliable, but it is very reliable in some of the older states, especially in Massachusetts. On page 460 of Dr. Hoffman's book, we find that mortality from cancer in Massachusetts has advanced as follows:—

1856.....	18.8	per	100,000	population
1860.....	27.2	"	"	"
1865.....	29.6	"	"	"
1870.....	35.4	"	"	"
1875.....	35.9	"	"	"
1880.....	52.0	"	"	"
1885.....	56.0	"	"	"
1890.....	61.9	"	"	"
1895.....	70.0	"	"	"
1900.....	71.2	"	"	"
1905.....	82.9	"	"	"
1910.....	89.5	"	"	"
1913.....	99.4	"	"	"
1914.....	?	"	"	"
1915.....105.0		"	"	"
1916.....	?	"	"	"
1917.....	?	"	"	"
1918.....	?	"	"	"
1919.....	?	"	"	"
1920.....115.3		"	"	"
1921.....118.0		"	"	"
1922.....116.6		"	"	"

Between 1856 and 1913 the cancer death-rate in Massachusetts has, according to the very reliable statistics of that state, increased more than fivefold. In Boston, according to page 479 of Dr. Hoffman's book, the cancer death-rate per 100,000 population, has advanced from 65.4 in 1881 to 119.9 in 1914.

Dr. Hoffman's book, which is quite unique, gives most interesting statistics for all the principal countries of the world. All the statistics tell the same tale. Everywhere among civilized nations the cancer death-rate is rapidly increasing. Japan is no exception to the rule. In that country, the cancer death-rate per 100,000 population has increased from 44.0 in 1899 to 66.9 in 1911.

The fact that the cancer death-rate is rapidly rising not only among the Western nations, but

MORTALITY FROM CANCER IN JAPAN, 1911–21

	Population of Japan	Deaths from Cancer and other Malignant Tumors	Death-rate per 100,000 Population
1911	50,683,600	33,888	66.9
1912	52,167,000	34,186	65.5
1913	52,917,600	36,845	69.3
1914	53,675,700	36,652	68.2
1915	54,448,200	37,494	68.9
1916	55,235,000	39,059	70.7
1917	56,035,100	38,714	69.1
1918	55,662,900	40,257	72.3
1919	—	—	—
1920	55,963,053	42,994	76.6
1921	56,787,300	43,234	76.1

among civilized Japanese as well, is shown by most interesting statistics which Dr. F. L. Hoffman published in the *Journal of the American Medical Association* of the 17th November, 1923. The figures given by him are shown on page 88.

In Japan, as in Great Britain, the United States, and other advanced countries, the cancer death-rate is rising with ominous rapidity and regularity.

On page 593 of his book, Dr. Hoffman has a most valuable table in which the cancer mortality per 100,000 population is compared in 1901-05 and in 1906-10 with regard to 25 countries. In all of these countries there is a considerable increase in the cancer death-rate, except in Switzerland, where there is a very slight diminution; but, then, Switzerland stands foremost among the countries with regard to cancer deaths.

On page 225 of Dr. Hoffman's book there is a table in which the cancer mortality of 24 countries is compared. It is shown on page 90.

It will be noticed that the most advanced countries, the countries in which civilization and hygiene have been most highly developed, have by far the highest cancer mortality. Why this should be the case will be shown in due course.

The figures given in this chapter prove conclusively that the cancer death-rate is rising in a truly terrifying manner. The extension of the cancer plague is not a statistical fiction, but an indisputable fact.

STATISTICS OF CANCER MORTALITY, 1908–12

	Number of Deaths	Death-rate per 100,000 Population
Switzerland	23,228	124.3
Holland	31,375	106.4
Scotland	24,399	103.0
Sweden	5,470	98.3
England and Wales	174,602	97.6
Norway	11,461	95.6
Germany	277,710	87.1
Ireland	17,796	81.2
Austria	113,221	80.0
France	123,840	78.4
New Zealand	3,731	75.2
United States (Registration Area)	202,621	74.7
Australia	16,778	74.3
Belgium	24,712	66.9
Uruguay	3,720	66.6
Italy	112,087	65.2
Japan	95,724	64.3
Ontario	7,912	63.6
Spain	51,135	52.3
Hungary	47,374	45.5
Cuba	4,855	44.6
Hawaii	392	40.7
Costa Rica	751	40.6
Chile	6,077	35.6

CHAPTER V

Is Cancer Caused by an Injury, Old Age, or by Irritation?

In the previous chapters I have shown that cancer is a most horrible disease, that science has not succeeded in discovering either its cause or a remedy, that it is a disease of civilization, being practically unknown among the native tribes which lead primitive lives, and that it is spreading with truly terrifying rapidity among all advanced nations, and particularly among those which are most advanced in civilization and hygiene. We shall now briefly consider whether cancer is caused by injury, such as a blow, technically called trauma, as is widely believed, or whether it is due to advancing age, or to irritation. I believe that none of these three is primarily responsible for cancer, and would like to give my reasons for holding this view before giving in the next chapter my own explanation as to the true cause and nature of cancer.

It frequently happens that a woman receives a blow in a tender spot, such as the breast, causing a contusion, and that a few months afterwards cancer develops in the very spot. It is therefore perfectly natural that it is popularly believed that a blow,

and especially a blow on a woman's breast, causes cancer. If blows in general caused cancer, there should be far more cancer among men than among women. However, among women, the sheltered sex, the death-rate from cancer is practically universally far in advance of the death-rate among men. Besides, if a blow on a woman's breast should lead to cancer, there ought to be a great deal of breast cancer among native women, who are more or less treated as beasts of burden and who get frequently blows on the breast. However, according to the evidence given in the third chapter, cancer of the breast is practically unknown among the women of primitive tribes.

While many laymen believe that a blow (trauma) on the breast of a woman leads to cancer of the breast, the great majority of doctors and surgeons deny that a blow on the breast causes cancer, although it may be followed by cancer. Drs. Deaver and McFarland stated on page 519 of their valuable book, *The Breast: Its Anomalies, its Diseases and their Treatment:*—

"The influence of trauma as a cause of malignant tumours of the breast is much disputed. Of 115 authors writing in the years 1901 to 1909 inclusive, 30 do not assign trauma as a cause of cancer. Phelps states that only 9 per cent. of authors since the middle of last century believed that transient injury might be a cause of malignant disease. In an analysis of a large number of cases reported by 22 writers, we find that on an average 9.5 per cent. of patients gave a history of injury antedating the development of the tumour. Most recent authorities are agreed that traumatic injury has some influence on

the development of carcinoma of the breast in certain individuals."

Dr. James Ewing wrote on page 110 of his work, *Neoplastic Diseases,* Saunders & Co., 1922:—

"There may be a benign or malignant tumour in the tissues before the injury. Many patients with cancer of the breast attribute their disease to some form of injury. Probably very few of these tumours are the direct sequel of the trauma, but a slowly growing cancerous nodule in chronic mastitis may be accelerated by a blow where the injury alone seems to be the immediate cause of the tumour. In any organ, a pre-existing lesion renders the effects of ordinary injury more severe and more noticeable."

W. Sampson Handley stated in the 2nd Edition of his important work, *Cancer of the Breast and its Treatment,* John Murray, 1922:—

"It is hardly likely that trauma can induce any malignant change in healthy epithelium cells. But if potentially carcinomatous epithelium is already present at the seat of injury, it appears certain that the injury may let loose this epithelium among the connective tissues and produce a clinical carcinoma."

Dr. Willmott Evans explained on pages 262 and 263 of his work, *Diseases of the Breast,* University of London Press, 1923:—

"There is a very widespread belief in the idea that injury of the breast may lead to the formation of a malignant growth. There is always a very natural wish in the mind of the patient to account in some way for the appearance of a cancer in the breast, so we should expect

that the patient would recall to remembrance any injury from which she had suffered a shorter or a longer time previously. . . .

"Any injury of more than a trifling nature does result in the formation of a locus minoris resistentiæ—that is to say, it lowers the resisting power of the part. I am inclined to think that a history of local injury, most commonly a blow, can be obtained in about one in four or five cases of cancer of the breast, but the statistics vary greatly."

Mr. Charles H. Mayo, the eminent American surgeon, wrote in his paper, "The Prophylaxis of Cancer," contained in the *Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic,* page 549:—

"It is generally supposed that carcinomata often develop from severe single injuries, but there is no evidence that single injury does other than call attention for the first time to a pre-existing tumour, or hasten the growth, of early or dormant malignancy."

Very likely the explanations given by Drs. Evans and Mayo are correct. Diseases habitually attack the weakest spot. F. D'Hérelle, of the Pasteur Institute, has shown in his valuable book, *Les Defenses de l'Organisme,* how the body defends itself against disease. If any part of our body is unduly weakened, the power of resistance is diminished commensurately. That may be seen by the everyday experience of the common cold. Cold-germs affect different people very differently. In some they invariably attack the nose, in others the throat, in others the chest. In some, a cold leads to stomach troubles, to bowel troubles, to gout attack, etc. Probably there need not be a benign or a malignant

tumour in the tissue before the injury. In many cases all the factors which are bound to bring about an outbreak of cancer have been accumulating for a long time in a man or woman, and a cancer attack is due or is overdue. The woman receives a relatively insignificant injury by a blow on the breast, or a man by a kick on the leg or a fall, and cancer not unnaturally breaks out rather in the slightly damaged spot where resistance has been weakened than elsewhere.

I would give an illustration which seems to bear out my contention. Cancer on the hand is extremely rare, except in the case of X-ray burns, etc. The *Journal of the American Medical Association* for 1919, vol. 73, page 1936, contains the following most interesting account by Dr. Daniel R. Mishell, worded as follows:—

"A Case of Cancer following a Sulphuric Acid Burn.

"So much is yet to be discovered concerning the circumstances surrounding the cause of cancer that any new facts seem worthy of being reported. With this point in view, the following case, seen in a city clinic, is submitted.

"C.M., a man aged 57, employed in a dye factory, presented himself at the clinic with a prominent tumour on the dorsal surface of his right hand. Seven months prior to this his hand had been burned by a few drops of sulphuric acid in a factory accident. Previously the tissues in this region had, according to the patient, always been normal. The initial burn left a small ulcerated surface about the size of a pea, which gave little pain but refused to heal. Three months later, the patient noticed

an increase in the size of the lesion, both in diameter and in height. Growth continued for the next four months. Examination revealed a mass of about 1½ inches wide and ¾ inch high, presenting a reddish ulcerated surface and a distinct red border. . . .

"The growth was excised by Dr. Van Ness, of Newark, N. J., and sections of the specimen were made. Healing was slow at first, a black crust undermined with pus and sloughing material having formed. . . . A microscopic examination revealed the fact that the tumour was an actively growing squamous-cell carcinoma, the diagnosis having been confirmed by Dr. Francis Carter Wood, of the Crocker Research Laboratory. . . .

"It is very unlikely in the present case that the acid itself was the etiologic factor in the production of the tumour, as thousands of sulphuric acid burns never become cancerous. A suggested explanation is that the acid burn and subsequent ulcerating condition merely provided a place of least resistance, which, combined with a certain predisposition and the 'cancer age' of the patient, led to the development of the malignant growth."

It is, of course, out of the question that a trifling injury, such as one caused by "a few drops of sulphuric acid," should bring about cancer. Otherwise every one should get cancer, for everybody gets more serious injuries than this in the course of his life. If cancer could be caused by a trifling injury of that description, we could not protect ourselves from the disease by any conceivable means.

While most doctors and scientists have abandoned the idea that cancer is caused by a local injury, by trauma, it is almost universally held that the disease is due to prolonged irritation. I am reluctantly compelled to challenge that opinion, and shall en-

deavour to disprove it. Colonel Mansell-Moullin, the eminent surgeon, contributed to the *Annals of Surgery* a paper, "The Cancer Problem," which appeared in 1915. On page 5 he states:—

"There are two factors, therefore, working together in the production of cancer and other tumours. One is arrest, or weakening of the power of development, due to failure in heredity, age, disease, injury, the interference of chemical or physical agents, or other causes. The other is local irritation, leading to increased cell-growth. The effect of their combined action is the production of masses of cells which never attain their perfect form and which increase with a rapidity that depends upon the stage at which their development was stopped, and upon the supply of food."

In the *Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic,* vol. 4 (W. B. Saunders Co., 1913), there is an important paper, "The Microscopic Examination of Fresh Tissues for the Diagnosis of Early Cancer," by Louis Blanchard Wilson. On page 721 of the volume mentioned we read:—

"Precancerous conditions, so far as carcinoma is concerned, seem to have one common basis element, i.e. chronic irritation of epithelium, with secondary formation of scar tissue, of masses of epithelium.

"In the skin, chronic ulcers of simple, syphilitic, or tuberculous origin, nodular keratoses, warts, etc., are the principal lesions on which malignant processes develop. The importance of these seemingly benign lesions in relation to cancer of the skin cannot be too strongly urged. Indeed, it is doubtful if cancer of the skin ever begins directly in normal tissue. There is always to be found the gross or microscopic evidence, or the undoubted history of a 'precancerous' condition.

"Similarly, careful search has revealed that in cancer of the alimentary canal, in all regions from the lips to the anus, a very high percentage of cases show undoubted evidence of a pre-existing chronic irritative process at the site of the malignant lesion. On the lips these may be ulcers, or areas of thickened epithelium from the smoker's pipe. On the tongue and inner cheek walls, ulcers from jagged teeth, leukoplakia, and syphilitic lesions are the most frequent bases. In the stomach and duodenum we have shown chronic ulcers to precede, most frequently, carcinoma, while in the large bowel, particularly the sigmoid and rectum, the chronic irritation around diverticula is the most frequent site of carcinomas.

"Of the urogenital organs, the kidney frequently harbours stones, prior to the development of flat-celled carcinoma of the renal pelvis, and the bladder is usually the site of much chronic irritation of its mucosa prior to the development of carcinoma within it."

Dr. W. S. Bainbridge wrote on pages 225 and 451 of his book, *The Cancer Problem,* New York, 1914:—

"It may be stated in general terms that, for purposes of prophylaxis, so far as cancer is concerned, no matter what the nature of the irritant, when its effects are sufficiently marked to become a menace, the cause of irritation should be obviated, whether it be a chemical irritant associated with occupation, an actinic irritation arising from X-ray or other burns, mechanical irritation from the friction of wearing apparel, or bacterial, as giving rise to certain local predisposing lesions.

"Prominent among these predisposing factors, for which one should be on guard, are: general lowered nutrition; chronic irritation and inflammation; repeated acute trauma; cicatricial tissue, such as lupus and other scars and burns; benign tumours, warts, moles, nevi (birthmarks), etc."

Dr. George W. Crile wrote in his article, "The Cancer Problem" in the *Journal of the American Medical Association* of the 6th June, 1908:—

"There is scarcely an instance of a complete account of a visible case of cancer that does not give a clear precancerous history—a history of chronic irritation, ulcer, scar, hyperplasia, innocent tumour, or a combination of these factors."

The memorandum "Cancer," sent out to the local authorities by the British Ministry of Health on the 14th August, 1923, summarized the generally accepted views as to cancer being caused by prolonged irritation as follows:—

"Chronic Irritation as a Determining Factor in the Appearance of Cancer.

"One certain fact about cancer is that it frequently follows on chronic and prolonged irritation. Not all tissues, however, are equally liable in this respect. The palm of the hand, for example, in spite of its exposure to chronic irritation of all kinds, is probably never the seat of cancer. In the female breast cancer occurs far more commonly in the deeper parts of the gland than in the nipple, which is more exposed to injury. Some tissues show a special liability to develop cancer during chronic irritation, such as the skin of the face, the lips, insides of cheeks, tongue, lower part of bowel, neck of womb.

"Certain varieties of chronic irritation, too, are more liable to be followed by cancer than others. Thus, in the lip, long-continued irritation by a clay pipe is particularly dangerous; in the tongue, irritation by a jagged tooth or badly fitting toothplate; in the womb, the chronic ulceration which may follow confinement. Again, syphilitic dis-

ease affecting the tongue or female external generative organs, or tuberculosis of the skin (lupus) affecting the face, particularly if it has necessitated prolonged treatment, is liable to end in cancer. And, lastly, workers in tar, such as briquette-makers, workers with aniline or paraffin, chimney-sweeps, and mule-spinners, are apt to suffer with cancer in special parts of the body as a consequence of repeated irritation by the particular agent concerned.

"This liability of cancer to follow chronic irritation of so many different types is remarkable, and leads to the supposition that beneath them all there lies some common factor—as yet unrecognized—which is fundamental to the passage of a chronic inflammatory and non-cancerous condition into one that is definitely cancerous. In one variety of cancer (rodent ulcer) the distribution of the new growth is such that it suggests a close relationship with the nerve supply of the affected part. How far this is true, and how far modifications of the body itself, as distinguished from the chronic irritant, play a part in the ultimate production of the cancer, it is impossible to say in our present state of knowledge."

Everybody who has travelled among primitive tribes reports that primitive peoples seem almost insensible to pain, and that they have not the slightest notion of comfort. Civilization, on the other hand, aims at painlessness and ease. It aims, therefore, at the elimination of irritation of every kind. Among the insensitive primitive tribes there is no doubt an infinitely larger amount of chronic irritation of the ordinary kind than is to be found among civilized peoples. It follows that there ought to be far more cancer "caused by chronic and prolonged irritation" among the Red Indians of North Amer-

ica, among the African negroes, among the wild hillmen of India, etc., than there is among the civilized Western peoples.

In Chapter III, a superabundance of reliable evidence has been given showing that cancer is virtually unknown among primitive races. It must therefore be concluded that chronic and prolonged irritation of the ordinary kind is not a cause of cancer. If irritation in itself were a cause of cancer, it should be least frequent among the delicately nurtured and well-tended and among the rich and the well-to-do. However, a large amount of testimony given in the first chapter, entitled "The Horror and the Mystery of Cancer," shows that cancer is most frequent among the prosperous and among the people who live at ease.

The warning that, to protect ourselves against cancer, we should avoid chronic irritation, which the various authorities quoted have uttered, is not very helpful. Irritation and drafts of cold air are equally unavoidable, for both are universal. Moreover, by far the largest number of cancers occur out of sight, in the stomach, and bowels of men, and in the breast, uterus, stomach, and bowels of women, as reference to the full statistical table given at the beginning of the seventh chapter will show.

Those who would act in accordance with the advice given in the foregoing would have to lead a life of perpetual self-denial and perpetual self-inspection. Moreover, they would have to live in the fear that every scar, burn, wart, mole, or birth-mark might give rise to cancer. If "chronic irritation" of the

ordinary kind were indeed the cause of cancer, there should be innumerable cases of cancer of the face among those who habitually torture their skin with a blunt razor. However, the saw-like razor, which is used by many millions in Europe, America, and Asia, practically never induces the dreaded disease. In my opinion chronic irritation has something to do with cancer, but it is not the true cause, as little as is trauma. Poison, not irritation, is, I believe, the chief cause of cancer. Cancer induced by chronic irritation, unless that irritation is poisonous, should be of the utmost rarity.

It is a well-known fact that there is very little cancer among people below the age of 40, while there is an enormous amount of cancer among people of 50 years and more. It is therefore widely held that cancer is a disease of old age and is somehow caused by old age. Very interesting theories have been put forward ascribing cancer to the waning of the sexual powers in men and women.

The old-age factor, like the irritation factor, seems at first sight indeed the cause of cancer. But closer examination seems to indicate that, as in the case of injury, of trauma, there is merely a coincidence of age and cancer in Western peoples. If age in itself was a cause of cancer, it should act as a generator of that disease also in primitive tribes. In some primitive nations there are few individuals who reach the cancer age. In others, especially in the Himalayan tribes and certain Red Indian and African tribes, longevity is very common. From the large amount of evidence collected in the third

chapter, it appears that there is practically no cancer among the aged and the very aged members of primitive tribes. We are therefore entitled to assume that old age is as little a direct cause of cancer as is injury and prolonged ordinary irritation.

In the following chapters I shall endeavour to demonstrate convincingly how the disease is caused.

CHAPTER VI

Cancer is Due to Chronic Poisoning and to Vitamine Starvation—Proof that Cancer is Caused by Various Chemical Poisons and by Burns after a Great Many Years

It is generally believed that cancer is caused by the following three factors:—

Injury (trauma), such as a blow on the breast.

Chronic irritation, such as that caused by a rough tooth.

Old age and physical decline.

I have endeavoured to show in the preceding chapter that none of these three factors can be considered as true cancer producers, and I hope that I have succeeded in my demonstration.

The scientific laws and theories put forward by the greatest scientists of yesterday are the derision of the schoolboys of to-day. I shall not endeavour to give my explanation in the terms used by modern biologists. I shall not mention words such as endocrines and anti-bodies, which have little meaning to the average reader. In fact, I am a little suspicious of some of the latest discoveries of the biologists and the biochemists. We know far too little about the human body and the way it works. That truly eminent biologist, Sir Arthur Keith, stated with the

modesty of commanding knowledge on the first page of his book, *The Engines of the Human Body,* London, 1919, a book which ought to be read in every school:—

"For two thousand years and more a countless succession of clever men have studied the body, both when it was living and when it was dead, have taken it to pieces—or, as medical students say, have dissected it—have examined its flesh and textures with the most powerful of microscopes, have applied to it all the arts and crafts known to chemists, and yet, after all these centuries of labour, after all the fine books which anatomists have written, we have to confess that we have not nearly mastered all the secrets of the human machine. . . . It may take many thousands of years more, but I am certain that the time will come when we shall understand the human body."

I am fully acquainted with the latest discoveries.

Nevertheless, I shall express my views in plain, everyday language.

In my opinion, cancer is due to chronic poisoning and to vitamine starvation. I have some hesitation in saying whether it is due to chronic poisoning aggravated by vitamine starvation or to vitamine starvation aggravated by chronic poisoning. Whether the one factor or the other is the more important seems a little doubtful to me. However, it seems to me that chronic poisoning is perhaps the more striking factor of the two, because it affects men and women directly, while vitamine starvation acts indirectly.

Having very closely studied the subject, I have come to the conclusion that approximately 90 per

cent. of all cancer cases can be directly traced to chronic poisoning, to the absorption of certain poisons, which has gone on over a long number of years. This chronic poisoning may be due either to poisons received from without, to chemical poisons, or it may be due to self-created poisons, chiefly bowel poisons, to so-called auto-intoxication, which is liable to follow chronic stagnation of the bowels. The latter cause will be investigated in the following chapters.

All cancers, though displaying an endless variety of form, are essentially one. If approximately 90 per cent. of all cancers are due to chronic poisoning which has been going on during a considerable space of time, we may safely conclude that the remaining 10 per cent. or so also are due to chronic poisoning. X-ray burns and other serious or frequently repeated burns are likely to lead to cancer in the parts injured. We may therefore assume that often repeated X-ray burns, extensive other burns, and various other injuries by fire or great heat, lead in the body to reactions which are equivalent to the reactions caused by chronic poisoning. They may therefore be considered for all practical purposes as cases of chronic poisoning. Poisoning and burns combined account for about 99 per cent. of all cancer cases.

My theory that burns of various kinds are to some extent equivalent to poisoning is countenanced by some most interesting experiments recently made by Drs. Bruce Robertson and Gladys L. Boyd, of Toronto. They transplanted the burned

skin of animals upon unburned animals, covering the burn wounds of the burned animals from the unburned, and the result was that the burned animals lived while the unburned ones sickened or died apparently from the poison developed by the burned skin transplanted upon them. These experiments are reported in the October number of the *Journal of Laboratory and Clinical Medicine* of St. Louis. We read in it:—

"Shock, hæmorrhage, and toxemia have each been offered as theories to explain the cause of death in superficial burns. As early as 1868, Wertheim believed death to be due to a toxin circulating in the blood, and six years later Ponfick came to the same conclusion. Shortly after, a toxic substance was found in the urine of burned animals by various investigators; Lustgarten thought this toxin was muscarine, or a similar substance. Reiss considered it a pyridine base. Ajello and Parascandello found a toxic substance both in the blood and urine of burned patients; they regarded the poison as a ptomaine. During the ten years ending in 1914, Herman Peiffer, of the University of Gratz, carried on extensive research into the etiology of death in burns. He came to the conclusion that there was a poison produced at the site of the burn which circulated in the blood. The chemical nature of the toxin he considered unknown, but thought it of a nucleoprotein nature, somewhat resembling snake venom. He not only noted the presence of a toxic substance in the urine of burned animals, but found an increased non-specific proteolytic ferment in it. This latter finding was also reported by Ferrae, but Parascandello was unable to corroborate their findings. . . .

"In twelve rabbits, fully anesthetized, the burned skin was removed at different intervals after the burning and transplanted to healthy rabbits, the skin from the latter

being used to cover the wound in the burned animals. Secondary infection occurred only in one case, the transplants taking in all other cases. Removal of the burned skin, less than eight hours after the animal was burned, saved the animal from all toxic symptoms, but removals subsequent to this time failed to prevent the development of toxemia in the animal. The rabbits receiving the transplants of burned skin exhibited toxic symptoms in all cases within an hour of the operation. . . ."

After describing a considerable number of experiments made with rabbits, dogs and pigs, the authors came to the following conclusions:—

"1. Death from burning occurring within the first 24 hours is practically always due to primary shock; later than this it is due to toxic shock.

"2. There is a toxin produced in burnt tissue, in larger quantities in skin burns, which circulates in the blood, either in, or absorbed by, the red blood corpuscles, and which causes the symptoms seen in bad superficial burns, and in some cases death.

"3. Extracts of burned skin are toxic. Extracts of skin burned post-mortem are innocuous. . . ."

If the findings of the two experimenters should be confirmed, and if the conclusions drawn from these experiments should be generally accepted, it would appear indeed that X-ray burns, injuries by fire or great heat, have effects similar to those following poisoning, that injuries by burns and by poisoning are akin or closely related.

There are certain peculiar and characteristic cancers which follow chronic poisoning by arsenic, aniline, etc. Frequently these cancers arise only after 10, 20, 30, or 40 years. The fact that the cancer

patient has absorbed aniline or arsenic or some other poison for 10, 20, 30, or 40 years does, of course, not prove that 10, 20, 30, or 40 years are needed for the development of cancer. I shall endeavour to show in this chapter by an overwhelming amount of evidence that certain poisons habitually lead to an outbreak of cancer only after 10, 20, 30, 40, or more years have gone by, that, for some reason or other, which may always remain obscure to science, chronic poisoning by small but continued doses, poisoning which is usually not recognized as such because it has no immediate ill effect, leads not to the consequences usually following poisoning, but to cancer after an incredibly long space of time.

Cancer on the hand is very little known, except in the case of X-ray burn. In the case of X-ray operators we have, therefore, undisputed evidence as to the length of time required between the burn or the burns and the outbreak of X-ray cancer on the hand, and we can clearly trace the development of the disease. It begins, as a rule, with a kind of eczema or inflammation, technically called dermatitis. The skin deteriorates. Pustules and warts follow, and in the course of time these degenerate into cancerous growths.

The *British Medical Journal* of the 9th December, 1922, contains a most interesting lecture on X-ray cancer by Mr. Cecil Rowntree, Surgeon to the Cancer Hospital, London. He stated:—

"In many of the cases the ulcerated areas were so superficial and so harmless-looking that a good deal of doubt

was at one time expressed as to the exact nature of the lesions. . . .

"Can cancer follow one large dose? I believe not, for, in spite of the very large number of patients who have been burned in the course of screening or of treatment, I have not been able to find a single case of epithelioma arising as the result of such a burn. . . .

"There are in London now two men who in the early days were constantly exposed for a year or two and were badly burned in consequence. They gave up X-ray work absolutely nearly 20 years ago, and have remained entirely free from cancer. The complete immunity of these two men and of the numerous burnt patients proves, I think, that one burn alone is not sufficient to cause cancer; while the non-immunity of the few X-ray workers who have escaped burns but who must for years have been exposed to small daily doses suggests that it is to a combination of one or more burns plus a long succession of quite small exposures that X-ray cancer must be attributed.

"For how long these small doses must go on, it is impossible to say, but I think it certain that very numerous exposures, spread over a very considerable period of time, must be required. In none of the cases of X-ray cancer I investigated was there a shorter period than 4 or 5 years between the first exposure and the first epithelioma. In most of them the interval was much longer—in fact, in two cases it was no less than 17 years. But it is not suggested that continuance of exposure during these long periods is essential, for it appears to be a fact that the changes of X-ray dermatitis, when once they are well established, are of a progressive character, and that cancer may develop long after any exposure to X-rays has occurred. . . .

"In X-ray cancer we possess the only clear-cut and well-defined example of the experimental production of cancer in man."

I have begun my demonstration with X-ray cancer because, as Mr. Rowntree remarks, "in X-ray cancer we possess the only clear-cut and well-defined example of the experimental production of cancer in man." None give us clearer data. I would draw attention to some most remarkable facts. In the first place, Mr. Rowntree says that *in none of the cases of X-ray cancer less than* 4 *or* 5 *years elapsed between the first exposure to the Rays and the first epithelioma.* This shows that the X-ray burn, or, as I prefer to call it, the X-ray poison, lies dormant for many years, that it acts cumulatively and only extremely slowly.

I stated in the beginning of this chapter that cancer was due to chronic poisoning. According to Mr. Rowntree, acute burns as a rule do not lead to X-ray cancer. In fact, Mr. Rowntree clearly states that *not a few severe burns but "a long succession of quite small exposures" leads to X-ray cancer. In other words, the X-ray poison acts cumulatively and only after a great many years have gone by.* I repeat this because I would strongly impress this most important fact upon my readers.

In many cases, X-ray workers become victims to cancer only 10, 15, or 20 years after they started X-ray work. Mr. Rowntree mentions two cases of "no less than 17 years." Besides, it seems that once the X-ray poison has become active, it will continue to work, even if the unfortunate victim has abandoned X-ray work long ago. In the words of Rowntree, "*cancer may develop long after any exposure to X-rays has occurred.*"

Every now and then we read of X-ray cancer developing after 20 years and more of X-ray work. The October 1923 number of the *English Hospital and Health Review* contained, under the heading "Another X-ray Martyr," the following notice:—

"Mr. R. Blackall, an X-ray worker at London Hospital, has had to undergo amputation of both hands. He is the third member of the hospital's X-ray staff to lose his hands in this manner. It is stated that at the present time there is ample protection for X-ray workers, but, unfortunately in the three cases mentioned, the harm was inflicted before the danger came to be fully realized. Mr. Blackall had been engaged in X-ray work since 1900."

Mr. Blackall had been engaged in X-ray work for 23 years, and he must have been working for a great many years with "ample protection"!

In the *Archives of Radiology and Electrotherapy* for August, 1923, we find on page 66 the following information on X-ray cancer:—

"The occurrence of skin lesions was first described by Marcuse in 1896, and a fatal case of carcinoma was recorded in 1904. . . .

"The case we are about to describe in the present paper is that of Mr. J. S., æt. 76, which came under our observation in 1921. The patient had been engaged in the practice of radiology for the last 20 years at the Oldham Infirmary. . . . The onset of skin trouble was rather indefinite, but about 1911 he began to experience a burning sensation in the hands, which was worse at night, and particularly after a long day's work with the rays. He did not use gloves before this time, but when these symptoms appeared he began to employ them, and thereafter used them as often as was possible.

"He soon noticed that 'the skin and tissues began to shrivel up and warts formed on the back of my hands, which later began to discharge.' There was no severe pain, such as has been a prominent symptom in many of these cases, the irritation and burning sensation being the most noticeable symptom and causing much discomfort as well as loss of sleep. These symptoms persisted throughout the whole time that the lesions were present. The ulcerated areas extended and refused to heal in spite of numerous treatments, and one of them became very large and took on a character which suggested a malignant change. . . .

"Owing to the disability, all X-ray work was given up in May, 1921, and, a diagnosis of malignant change having been made, the first, second, and third fingers of the right hand were amputated at the metacarpo-phalangeal joints by Dr. A. H. Godson, of Oldham, on June 8th, 1921. The wounds healed well. Histological examination of the main ulcerated area on the right hand was made and sections were also examined of warts in different stages of development. The large ulcerated area just mentioned showed the presence of a typical squamous-celled carcinoma."

In the case described, some vague skin trouble began 10 years after radiology was undertaken, and cancer definitely developed 20 years after the first exposure to the cancer-creating poison rays!

Radium has apparently a similar effect. On page 153 of the *Archives of Radiology and Electrotherapy,* published in October, 1923, we read in an article entitled "Observations on Radium Dermatitis"—dermatitis means inflammation of the skin —written by Dr. Sydney Thomson and others:—

"Radium dermatitis, being much less common than the condition produced by X-rays, has received small attention in this country, although the Americans have considered the matter in some detail. . . .

"Clinically the pictures produced by excessive exposure to the X-rays and to radium are indistinguishable. This is to be expected when it is remembered that the gamma rays of radium are in juxtaposition in the spectrum with, and overlap, the X-rays."

This important fact is demonstrated by the following case:—

"Mr. ——, æt. 65, has been handling radium salts continuously since 1904. During 1913 he noticed for the first time a little roughness of the hands; at the same time he experienced a tingling sensation in the fingers. The war saw a very considerable increase in the amount of material that passed through his hands, with the result that in 1916 his hands became discoloured and his nails began to fissure and were very friable. The first appearance of warts was delayed until 1920, since when they have gradually increased in number. To-day the skin of both hands is atrophic, thin, dry, and wrinkled; there are scattered about numerous small patches of lightish brown pigmentation. . . .

"For histological purposes the largest wart was excised under local anæsthesia. The wound healed well. Sutton has pointed out that radium burns, although very similar to those caused by the X-rays, are less painful and heal much more readily.

"The picture presented under the microscope is that of chronic inflammation, together with very early squamous-cell carcinoma."

The victim noticed "a little roughness of the hands" 9 years after he had begun handling radium salts. The first warts appeared in 1920, 16 years after the first exposure, and, only nearly 20 years after handling these dangerous salts, the first evidence of carcinoma was found by the microscope.

On page 381 of the *Archives of Radiology and Electrotherapy* for May, 1923, there is the following information:—

"Skin Cancer following Exposure to Radium. W. J. Macneil and G. W. Willis (*Journ. Amer. Med. Assen.*, Feb. 17th, 1923, page 466) report an interesting case of skin cancer, following exposure to radium, which occurred in a medical practitioner, aged 46. This patient worked with X-rays in his practice from 1905 to 1917, but not since; he was fully cognizant of the danger of X-ray burns, and precautions for self-protection were carefully employed. From 1912 to June, 1920, however, he handled radium without any precautions for self-protection; he used it in small amounts up to 1915, but in quite large amounts from 1915 to 1920, 200 to 365 mg. in individual tubes being taken betwen the right thumb and forefinger almost every day.

"Various changes, which might be ascribed to the exposure to radium, began to be observed late in 1916, and since early in 1920 the skin changes required constant care. In September, 1922, a fissure on the ball of the right thumb underwent a peculiar and extremely painful alteration in character, and did not improve under various treatments. The central portion of the lesion was excised, and, on microscopical examination, was found to be a disintegrating squamous-celled carcinoma, extending beyond the limits of the specimen examined. Immediate amputation of the thumb was advised, and this was carried out on the following day. The condition was then found, on further examination, to be a squamous-celled carcinoma of the distal phalanx of the right thumb extending to the base of the phalanx; there were hyperkeratosis and parakeratosis of the cutaneous epithelium.

"The authors admit that the earlier work of the patient with X-rays throws some little doubt on the causal relation of the radium. On the evidence, however, they are strongly

inclined to the opinion that radium may, when exposure has been sufficient, give rise to changes in the skin predisposing to development of malignant new growth, and that the radium had precisely this effect in the case reported."

The patient had been using X-rays, and later on radium, since 1905. His skin began to suffer in 1918, and only in 1922, after 17 years of work, did cancer make its appearance.

Many similar instances showing that X-ray cancer and radium cancer occur only after a great many years could be given. As frequently the victim has not been exposed to the effect of X-rays and radium for a number of years preceding the appearance of cancer, it seems clear that for some reason or other the poisonous effect of the rays continues for a long time, until at last it culminates in the outbreak of the dread disease.

More than a quarter of a century ago, the celebrated surgeon, Sir Jonathan Hutchinson, F.R.S., startled the world by an address contained in the *Transactions of the Pathological Society of London,* 1887, in which he showed that the continued medical use of arsenic in extremely small doses may lead to cancer after 20 years or more. He stated in his lecture, which was entitled "On Some Examples of Arsenic Keratosis of the Skin and of Arsenic Cancer":—

"Dr. W——'s psoriasis began at about 20 years of age, and he soon afterwards commenced the use of arsenic. Corns began to form on his hands when he was 34. They ulcerated when he was 42, and the first scraping was done

at 44. He came to England in the same year. Amputation was done 8 months after the scraping, and he died 18 months after the former. . . .

"Miss H., when aged 5 years, came under Dr. Clifford Allbutt's care for pemphigus. It was a very bad case. She took arsenic and it stopped the eruption. The latter, however, relapsed, and she got into the way of taking arsenic herself. The inner aspects of her hands and fingers became 'very rough.' She married before 20 and had a child born. When 25 years of age she came again to Dr. Allbutt with a large open ulcer behind the crest of the ilium of the left side. She said that there had been a roughness on the spot, and that she believed the sore had been caused by her clothes hitching. There was a secondary glandular swelling in the groin. Subsequently a lump formed in the skin of the inner aspect of the thigh, 'hard, yellowish, reddish, and purple mottled, but not pigmented.' At this stage the gland mass 'had ulcerated,' and it, as well as the original, were described as like a tomato in colour and shape, having lumpy, everted edges. No opportunity for microscopic examination ever occurred, but that the patient died of malignant disease, sarcomatous or epithelial, there can be no doubt."

In the one case of arsenic cancer described, ulceration began 22 years after the use of arsenic had commenced. In the other case a "large open ulcer," evidently malignant, appeared 20 years after the beginning of the use of arsenic.

In the *British Medical Journal* of 1916, page 78, the celebrated surgeon, Sir John Bland-Sutton, described as follows, under the heading "A Case of Arsenic Cancer," the genesis of cancer in a woman who had continuously taken arsenic in medical doses for 30 years:—

"A woman, aged 60, came under my care in the hospital with a large ulcer just below the left knee; it had the usual signs of cancer of the skin. . . . For 30 years she had suffered from psoriasis, and during this period taken more or less continuously arsenic in the form of liquor arsenicalis. In 1913 a pimple appeared at the lower border of a scaly patch on the skin, just below the patella. This pimple gradually became an ulcer, that was frequently scraped and cauterized. In spite of this treatment, it increased in size; in 1916, when she came under my care, it had become a typical cancerous ulcer as big as the palm."

In the case mentioned, cancer occurred after continued absorption of arsenic no less than 30 years.

In the *British Medical Journal* of the 18th November, 1923, Dr. Henry C. Semon describes, under the heading "A Case of Arsenical Keratosis followed by Cancer," an outbreak of that disease 28 years after arsenic was medically used. This case is particularly remarkable because the typical arsenic hyperkeratosis on palms and soles appeared "14 years after the cessation of the drug." Dr. Semon stated:—

"The patient, aged 40, who was referred to me by Dr. H. C. G. Pedler, London, had a more or less generalized psoriasis at the age of 12, and as the eruption was controlled by arsenic, he persisted with its administration, and without further medical advice, for 7 years. By this time (1901) pigmentation of the abdomen and warty growths on the palms and soles had developed, and his father consulted Sir Malcolm Morris, who at once recognized the cause and forbade any further treatment with arsenic in any form.

"In 1905, he consulted the late Sir Lauder Brunton for œdema of both feet, one wrist, and the dorsum of the left

hand. In 1914 (that is, 14 years after the cessation of the drug) the hyperkeratosis on palms and soles was as obvious as ever, and a small painless ulcer made its appearance in or around one of the warty growths on the outer border of the right sole. The ulcer persisted. . . . The right leg was amputated through its lower third by Mr. T. T. Higgins on August 18th, and recovery was uneventful."

This case illustrates my contention that, for some reason or other, the poison, or poisons, generating cancer, require, as a rule, a great many years for development until they lead to an outbreak of the disease, and that years of non-exposure may elapse before cancer occurs. One might compare the genesis of cancer to that of an animal, let us say a poisonous snake, which requires a considerable number of years until it has arrived at maturity, and which can bite and kill the patient only when it has become fully matured after very many years have gone by.

So far I have given only a few individual cases, and readers may believe that they are exceptional cases which need not be taken very seriously. However, I shall now show by a large number of examples that entire classes of sufferers from cancer contract the disease only 20, 30, or more years after having been exposed to certain poisons.

The cobalt mines at Schneeberg, Silesia, carry arsenic in the ore. Breathing in arsenic, the miners contract a most unusual form of cancer—cancer of the lungs—in very large numbers, but it seems to develop in them only "after having been employed in the mines more than 20 years," according to the

following extract from a paper by Abramowski, "Disposition und Irritation bei Krebs," which appeared in the *Zeitschrift für Krebsforschung* in 1911. We read on page 241:—

"It is very remarkable that, according to Harling and Hesse, many miners engaged at the Schneeberg cobalt mines have died of primary cancer of the lungs. Of the 600 to 700 miners employed, there are per year from 21 to 28 deaths, and 75 per cent. of these deaths are due to primary cancer of the lungs. The disease develops only in miners when they are 40 years old, after having been employed in the mines more than 20 years."

Arsenic, like X-ray burn and radium burn, acts obviously as a cumulative poison, leading to cancer only after a very long number of years.

While arsenic cancer has the peculiarity of breaking out on the palms of the hands and the soles of the feet in cases such as those first described, and in the lungs in the case of the Schneeberg miners—all these locations are extremely uncommon—there is another very uncommon site for a particular kind of cancer, namely aniline cancer, which, for some reason or other, as a rule attacks the bladder. A great many cases of aniline cancer are known. The *Journal of the American Medical Association* of the 20th May, 1922, contains an article, "A Basis for the Prevention of Cancer," by Dr. W. M. L. Copin, which reviews the development of aniline cancer of the bladder as follows:—

"Hamilton has fully reviewed our knowledge of so-called aniline tumours of the bladder. Curschmann compiled 177 cases. Hamilton cites evidence to show that irritation must

be prolonged from 2 years (the shortest on record) to 30 years, the average exposure being 19 years.

"It is interesting to note that bladder tumours in dye-works appear earlier in life than is usual for vesical growths. As in roentgen-ray cancer, the tumour may develop long after exposure to the exciting cause has ceased. Luenenberger records an instance in which a man worked in dyes 7 years, developed cystitis, transferred to another department 2 years, left the factory, and 2 years later developed blood in the urine and was operated on for bladder tumour. Schwerin reports cases in which tumours appeared from 8 to 20 years after the patients left the factory.

"The nature of the active body is unknown; one may infer from *Hamilton's Review* that she might believe that arsenic is the factor. A most interesting fact is that the chemical agent passes the barriers to its absorption, presumably through the excreting cells of the kidneys, and finally exerts its action on the mucosa of the bladder. That the other structures appear to escape is most suggestive of some cytochemic electivity of action, the contemplation of which must arouse all sorts of speculations as to the possibility of such activity of this and other substances on other organs, particularly on secreting or protecting cells. The protracted latent period, and the fact that contact with dyes may have long ceased, recall those instances of smokers' cancer that appear after the habit has been discontinued. . . ."

According to Dr. Hamilton, quoted by the author of the foregoing extract, "average exposure to anilin poison was 19 years" in a certain number of cases, and I would draw particular attention to the fact that, according to Schwerin, "tumours appeared from 8 to 20 years after the patients left the factory." This most interesting statement confirms

my view that normally the poison leading to an outbreak of cancer has to breed for a great many years within the body, and that the process of incubation continues even if the patient is no longer exposed to the cumulative effect of some poison or poisons which he has continuously absorbed in exceedingly small doses throughout an extremely long period.

In vol. 75, page 321, of the *Journal of the American Medical Association*, there is an article, "Dye Workers' Cancer an Important Industrial Disease," in which we read:—

"In any consideration of the general problem of the etiology of cancer, one of the important outstanding features of comparatively recent development is the fact that chemical irritation is quite as potent as mechanical irritation in producing malignant growths. Indeed, the classical illustration of cancer production by mechanical irritation in the case of the chimney-sweep is now generally believed to illustrate the effects of chemical irritation by products of the destructive distillation of wood and coal. Paraffin-workers' cancer is now an accepted reality. . . .

"One of the striking things about these tumours is the long interval between the first exposure of the workmen to the dye-stuff and the appearance of the first symptoms of cancer. Ordinarily, this is more than 10 years, most usually about 15 years, and in some as long as 28 years, but in one case cancer developed in 2 years. In many instances the cancer has developed in workmen who have been engaged in other than dye-works for a period of 10 years or more."

According to the author, aniline cancer occurs "most usually about 15 years, and in some cases as long as 28 years," after the first exposure, and we

hear once more that aniline workers are apt to get aniline cancer after having kept away from aniline works "for a period of 10 years or more." The slow development of the aniline poison in the body is identical to the slow development of the arsenic poison, the X-ray poison, and the radium poison. Readers will now understand why I refer to X-ray and radium burns as equivalent to poisoning. Identical consequences usually spring from identical causes.

Among the poisons which, when absorbed in extremely minute quantities, are apt to lead to cancer, tar, pitch, and paraffin occupy a very important position. Tar cancer, pitch cancer, and paraffin cancers possess very marked characteristics, differentiating these cancers from X-ray cancer, arsenic cancer, aniline cancer, etc. Those who have developed cancer in consequence of handling tar, pitch, and paraffin show the disease, as a rule, only when they have worked with these dangerous substances "about 10 years or more." The Annual Report of the Chief Inspector of Factories and Workshops for the year 1919 states on page 61:—

"In the case of those handling tar, pitch, and paraffin, however, especially when the workers are over 35 years of age and have worked for about 10 years or more, the ulceration following on the skin irritation set up may not heal, but spread over a large area of the surface of the skin and extend downwards into the flesh; it is then to be regarded as epitheliomatous or cancerous, and this is the condition to be notified."

The *British Medical Journal* of the 9th December,

1922, printed a very important paper, "On the Occupation Cancer of the Paraffin and Oil Workers of the Scottish Shale Oil Industry," by Dr. Alexander Scott, who holds the position of surgeon and medical examiner of workers in the Scotch oil-fields. That high and most experienced authority stated:—

"Epitheliomata, as seen among the paraffin workers of the Scottish shale oil industry, occur only in those about, or over, middle life who have been so employed for 20 years or more. . . . The warts or papules from which this condition arises have, as a rule, been present for many years in a benign form until the epithelial covering begins to proliferate more rapidly, with increasing growth of the primary lesion, until the characters of malignancy develop. These epitheliomata are only met with on those who have been paraffin workers for many years, and indeed those which I have seen have occurred after 20 or more years' work among the paraffin materials, the majority being seen after between 25 and 30 years of such service. . . .

"Epitheliomata also occur among retortmen, oil workers, stillmen, and labourers, these being a large group of workmen, approximately 5,000 in number, quite distinct from the paraffin workers. These men do not come into such intimate contact with paraffin substances in the course of their work, and accordingly do not suffer from any of the papular or inflammatory lesions which occur among the paraffin workers. . . . The epitheliomata which occur in oil workers and labourers, as distinguished from paraffin workers, without any primary condition of dermatitis, are, as a rule, found amongst those men—such as retortmen, labourers, stillmen, oilworkers, etc.—who come into contact with ash, coke, or other gritty material. The scrotum is most frequently the site of such lesions, this being due to the difficulty of ensuring cleanliness of this region.

"I have made a list of all cases of paraffin epithelioma which have occurred during the 22 years from January 1st,

1900, to December 31st, 1921. In all, 65 cases have occurred, of which 19 have been on paraffin workers proper, most of which cases have been seen by me, and 46 among the other grades of labour employed, such as retortmen, stillmen, etc., many of these cases having come under my observation. Since 1918 I have periodically inspected the paraffin workers proper, and so have been able to observe the gradual development of malignant features from simple primary lesions, and to have growths removed at an earlier stage than formerly. . . .

Length of Service.—The importance of a long period of service in paraffin departments as a predisposing cause of chronic indurated dermatitis and epitheliomata is apparent from the following figures. Of 12 paraffin workers who have extensive indurated dermatitis (dermatitis erythematosa) at one examination, the individual lengths of service were 39, 38, 36, 34, 33, 29, 28, 27, 22, 21, 18, 18 years respectively. As epitheliomata of paraffin workers are associated with this indurated dermatitis, the importance of long service is apparent."

It will be noticed that, according to Dr. Scott, "the majority of cases occurred after between 25 and 30 years of service," while some occurred after 33, 34, 35, and 39 years. The cancer poison is truly a very slow-working poison.

Likewise on the 9th December, 1922, the *British Medical Journal* printed a lecture by Dr. Archibald Leitch, Director of the Cancer Hospital Research Institute, London, entitled "Paraffin Cancer and Its Experimental Production." The salient passages were as follows:—

"The workmen engaged in the cruder products are prone to various skin eruptions, affecting principally the arms, which are directly exposed, and also other parts, especially the scrotum, through their oil-sodden clothing. These skin

affections comprise acute paraffin dermatitis, which most of the workers develop within a few days of starting employment, more chronic conditions which make their appearance later and may persist for years, and finally papillomata and true epitheliomata. The occurrence of cutaneous cancers of the arms and scrotum in paraffin workers has been well recognized for over 50 years by medical men practising in that district of Scotland, though few of them have recorded their observations in medical journals. . . .

"Though we refer to the lesions as 'paraffin cancers,' it is by no means certain that the particular harmful agent in the oils is a member of the paraffin series; both shale and German brown coal yield, in addition, olefines, naphthenes, aromatic compounds, and a host of other chemical substances in lesser amounts. . . .

"Whatever the chemical of the substances may be, we have in crude paraffin oils something that induces neoplasia. The skin cancers that they produce are all of an exactly similar type; they occur on sites unusual for squamous carcinomata unassociated with definite forms of irritation; they are frequently multiple; they are generally preceded or accompanied by warts or other hyperplasias; they are often of a low degree of malignancy; and it takes several years of exposure to the noxious substances before they develop—never less than 10 years in the German industry, and probably never less than 15 in the Scottish oil-works. . . .

"In our previous experiments with coal-tar we found, as other workers have found, that it was comparatively easy to induce cancer formation in mice by continuing the applications to the same area of the skin for several months. We wished, therefore, to see if we could obtain similar results by the use of shale oil. . . .

"By the frequent application on shale oils containing paraffins we have thus produced tumour formations in no less than 30 out of 74 mice which survived the treatment

for over a hundred days. Owing to the increasing death-rate after that time, it is impossible to say how many more would have developed tumours had they lived long enough, or how many of the simple tumours produced would have gone on to malignancy. . . . The sarcomatous development which in these two cases occurred underneath previously existing papillomata is probably due to the entrance of the carcinogenic agent into the subcutaneous connective tissue through small fissures in the overlying epithelium. Sarcomatous formation has not been found in the workmen in the paraffin refineries, but the observation in mice is of interest in that it demonstrates that the same causal agent may produce two such widely different kinds of malignant tumours as epithelioma and sarcoma. If we reckon that the life of a mouse is roughly one-twentieth that of man, and that its reactions, as far as neoplasia are concerned, are correspondingly speeded up, we may conclude from our experimental evidence that it takes at least 10 years of exposure to paraffin oils to produce cancer in man—which corresponds to actual experience."

After stating that exposure to the various cancer poisons is required during "never less than 10 years in the German industry, and probably never less than 15 years in the Scottish oil-works," the author described experiments whereby cancer was produced in mice by applying shale oils to their skin. The mice developed cancer only a long time after the painting with paraffin had begun, and the author concluded: "If we reckon that the life of a mouse is roughly one-twentieth that of a man, we may conclude from our experimental evidence that it takes at least 10 years of exposure to paraffin oils to produce cancer in man—which corresponds to actual experience."

A very eminent authority on cancer, when discussing with me the creation of cancer in mice and rats by painting them with tar, told me that the period which elapsed between the first painting with the poisonous substance and the outbreak of cancer was so long that it was equivalent to from 20 to 30 years in the case of human beings.

On pages 97 and 122 of the *Eighth Scientific Report of the Investigations of the Imperial Cancer Research Fund,* London, 1923, we find the following statement under the heading "Epithelioma: Paraffin Workers' Cancer":—

"Epithelioma, occurring among tar and paraffin workers, was first described by Volkmann (1874) and at later dates by others, while cases from Scottish oil-works were shown as early as 1879 and subsequently.

"Epitheliomata, as seen among the paraffin workers of the Scottish oil industry, may be defined as epithelial growths followed by ulceration and necrosis of tissue, having their origin in the epithelial layers of warts or papules. This condition occurs in workmen about or over middle life, who have been paraffin workers for long periods—20 years or more. They usually arise from warts due to chronic dermatitis or the indurated papules already described, and therefore usually coexist with an advanced dermatitis erythematosa in which wartiness is a prominent feature, or with indurated papules of a simple nature.

"The usual appearance is that of a gradually growing epithelioma in the midst of a chronic indurated dermatitis with numerous simple warts or indurated warty papules, only one of which has become malignant. I have seldom seen more than one epithelioma at one time on the same individual, though it is not uncommon for the same workman to have different growths at various times over a period of years.

"The warts or papules from which this condition arises have, as a rule, been present for many years in a benign form until the epithelial covering begins to proliferate more rapidly, with increasing growth of the primary lesion, until the characters of malignancy develop. These epitheliomata are only met with on those who have been paraffin workers (or oil workers) for many years, and indeed those which I have seen have occurred after 20 or more years of work among paraffin materials, the majority being seen after between 25 and 30 years of such service. . . .

"The most common situations are on the back of the hands, lower third of forearm, and scrotum. It has been seen on the face at the outer and inner angles of the eyelids, the features of rodent ulcer being sometimes assumed. . . .

"Length of service is of considerable importance in determining the nature of the skin lesions. As previously stated, the primary form of pustular dermatitis appears after a few weeks' work in the paraffin sheds. The papular types likewise appear after a few weeks' service in these departments, though papules disappear and others form throughout the duration of continuous employment as paraffin workers. An opportunity of verifying the early appearance of papules occurred after cessation of work for a period of 6 months recently. A few weeks after the man ceased work in the paraffin sheds all recent papules disappeared, to reappear a few weeks after resuming work, the earliest manifestations being got in from 12 to 14 days.

"The presence and degree of erythematous dermatitis are in proportion to the length of service. The less extensive and less indurated conditions begin to appear after about 7 to 8 years, while the more indurated and more chronic types are only seen on men who have completed many years of service, the worst cases having been continuously thus employed for terms varying from 20 to 40 years. As might be expected, epitheliomatous conditions are only found after long terms of service, these usually arising from chronic warts or papules, which may exist in

a benign state for many years before undergoing epitheliomatous changes. Those affected during recent years have been paraffin workers for periods from 30 to 40 years."

It seems that burns, if often repeated, though individually slight, as in the case of X-ray burns and radium burns, lead to consequences identical to those which are brought about by the protracted absorption of minute quantities of poisons, such as arsenic, aniline, crude paraffin, and so forth. Apparently frequent burns caused by sun-rays have a similar result. White men in India are careful not to expose themselves to the sun during the heat of the day. The Australians take no similar precaution, although the sun in a certain part of Australia is as hot as the Indian sun, and the result is that many Australian open-air workers are apt to suffer from cancerous developments of the skin exposed to the fierce glare of the sun.

Very extensive ordinary burns also are apt to lead to cancer developing on the scar. Dr. Wolff states on page 176, vol. 2, of his *Lehre von der Krebskrankheit*:—

"Scars are frequently the seat of cancers, and all authorities agree that cancers arise particularly frequently from scars caused by burns. That may be seen by the observations of Velpeau, Heurteaux, Clement, Marcuse, Billroth, Boegehold, Kindler, Nithak, Chaintre, Schneider, Chavannaz, Verdelet, Baasner, and others."

There is apparently some connection between scars and cancer, and particularly between scars caused by burns and that terrible infliction. There is a long and very important paper, "The Connec-

tion between Cancer and Scars," written by the brothers Theilhaber, who have a well-known clinic in Germany, which appeared in the *Zeitschrift für Krebsforschung* in 1910. The authors stated in it:—

"Every man of advanced years has a number of small scars on the hands which are often not visible by cursory inspection. These scars are particularly numerous in the case of tailors, bootmakers, seamstresses, who cut themselves almost daily, and in the case of butchers and cooks, who cut themselves frequently. However, it is extremely rare that such scars lead to cancer. Men who shave themselves cut themselves often, but cancer very rarely lodges in the scars. Men of the German universities who have fought duels have frequently large scars on their faces, but cancerous development in these scars has hardly ever been noticed. Peasants and agricultural labourers living in districts in which it is customary to go barefooted have, as a rule, many scars on the soles of their feet, but these scars hardly ever lead to cancer, and I have never heard of cancer arising in the scars caused by the piercing of girls' ears. Everybody frequently bites his tongue. Considering the frequency of this occurrence, cancer of the tongue is extremely rare. . . .

"It happens very frequently that scars due to lupus degenerate and become cancerous. There is a large literature on the subject. . . . Lupus cancer occurs most frequently in the face, which is most exposed to lupus. In most cases cancer developed only after lupus had been in evidence for a very long time. On the average it occurred only after about 30 years. According to the evidence collected by Ashihara, lupus cancer occurred in seven cases out of seventy-nine after 10 years. The shortest period was 4 years and the longest was 55 years after the occurrence of lupus. . . . Nithak observed cancer arising from a lupus scar in the case of a man 25 years old who had

suffered from lupus 21 years. In another case lupus cancer occurred in a patient 45 years old who had suffered from lupus for 36 years.

"Syphilitic scars very frequently lead to cancer. Some authorities, particularly Esmarch, point out that syphilis causes a general predisposition favouring the development of cancer.

"Scars caused by burns have frequently led to cancerous development, especially when they are large and deep-seated. Hoepke describes a case of cancer arising in a large scar from a burn extending over the entire right arm. Cancer developed in that man at the age of 34, 27 years after the burn had occurred. Markuse describes the case of a girl who suffered from cancer at the age of 23, 17 years after having suffered from extensive burns on the thigh and the lower part of the leg. Petitfils treated cancer in a patient 51 years old, 36 years after an extensive burn on the hand. Bogehold describes three cases of cancer arising from scars caused by burning. He tells of an extensive burn on the back at the age of 15 years and cancer arising in the scar at the age of 37 years. In another case a child suffered a large burn on the arm which was followed by cancer at the age of 46 years. In a third case a boy had an extensive burn on the thigh when 17 years old and fell a prey to cancer when 42 years old. Feldmann observed scar cancer on the head of a girl, aged 19, who had suffered severe burns on head and arms, 17 years previously. Pedraglia tells of extensive burns of a patient's face at the age of 1, which became the seat of cancer at the age of 45.

"Cancer of the buccal cavity, of the throat, the œsophagus, and the nose likewise arise frequently from scars. Particularly frequently cancer develops in a place which has been irritated during many years by carious teeth.

"Cancer of the gall bladder is frequently caused by the ulceration and scars caused by gall-stones, and cancer of the bladder frequently follows stones in the bladder."

The authors tell us that cancer develops in lupus scars "on the average only after about 30 years," and give instances of cancer having developed in scars resulting from burns 27 years after the burn, 22 years after the burn, 40 years after the burn, 25 years after the burn, 17 years after the burn, and 44 years after the burn.

I have given in the preceding pages an overwhelming number of instances showing that cancer is a very slowly developing and maturing disease which is aroused in the body by the continued absorption of minute doses of poison which act cumulatively and which eventually lead to the outbreak of cancer at some weak spot or other.

I am fully aware that my view is not only opposed to the views held by scientists and medical men in general, but that it stands apparently in contradiction with everyday experience. The view held by a great many scientists and doctors that cancer is not a general disease, but a strictly local disease, at least at the outset, may be found expressed in a great many books. For instance, the Portsmouth surgeon, Childe, wrote on page 63 of his book, *The Control of a Scourge: How Cancer is Curable,* published in London in 1907:—

"Cancer is, in its beginning, a local disease, and confined at first to the part it first attacks. From its local site of origin it generally very soon disseminates itself into the system of its victim."

The contention that cancer is a strictly local disease seems confirmed by the fact that a local cancer,

if not extirpated in time, spreads, "proliferates," according to the technical term, and thus affects the surrounding tissues and the body in general. On the other hand, it is a well-known fact that if a local cancer is cut out soon enough, the patient may never have a recurrence. In my own family there have been two cases of people, one operated on for cancer on the lip and another for cancer of the breast, where both patients died about 10 years after, but not from cancer. Opponents to my theory may say: "If, as you contend, cancer is a general body disease, not a local disease, then cancer should be incurable by local extirpation, and should promptly break out again elsewhere." That argument seems unanswerable, but I think there is an obvious reply to it.

I have shown by an enormous amount of evidence that the incubation of cancer requires, as a rule, 10, 15, or 20, or even more years. Very likely the average is approximately 20 years. It may be said that an effort of 20 years is needed to bring about a cancer attack. It is quite possible that a local operation does not destroy the cancerous disposition of the body, but that another period of 10, 15, or 20 years is required to incubate another outbreak unless the habits of the individual are changed. Naturally very few people get old enough to have a second cancer attack 10, 20, or more years after the first. A great many cases might be given showing that the successful operation of cancer was followed after 10, 15, 20, or more years by another primary cancer outbreak, by an outbreak *quite unconnected*

with the first one. Every cancer hospital has recorded such cases. I would merely quote two rather extreme cases which were described fairly recently. In the *British Medical Journal* of the 24th June, 1922, there appeared the following account:—

"CANCER OF THE TONGUE: EXCISION OF TONGUE.
"CANCER OF THE STOMACH 34 YEARS LATER.

"H. T., aged 72, was under my care for several months suffering from vomiting, pain in the epigastric region on swallowing food, and loss of weight. Malignant disease of the lower end of the œsophagus or cardiac end of the stomach was diagnosed, and he was admitted to Warrington Infirmary on May 2nd, 1922, for the operation of gastrostemy. The operation was performed next day, and he died on May 11th.

"The interesting point about this case is that the patient's tongue was completely excised for epithelioma 34 years ago at the Skin and Cancer Hospital, Myrtle Street, Liverpool, by the late Dr. Stopford Taylor. Unfortunately there is no written record available at the hospital, but the Secretary, Mr. W. R. Driver, informs me that the present dispenser remembers the case to be one of epithelioma, and that he was present at the operation. This statement is corroborated by the patient's relatives, who remember clearly that a piece of the tongue was first excised (presumably for microscopical examination) before the major operation was undertaken. There was no recurrence after the first operation, and the patient lived an active and healthy life for 34 years until attacked by the carcinomatous growth of the stomach which ended his life. This growth had no connection with the growth of the tongue, and was evidently of independent origin.

"(Warrington.—J. S. MANSON, M.D., D.P.H.)"

A few months later, on the 30th September, 1922, the *Lancet* published the following:—

"A Note on a Case of Carcinoma Mammæ.

"By G. H. Colt, M.B. Camb. F.R.C.S. Eng.; Asst. Surgeon, Royal Infirmary, Aberdeen.

"The records at the Aberdeen Royal Infirmary show that on August 30th, 1890, a female patient, aged 35, was operated upon by the late Dr. Mackenzie Booth for carcinoma mammæ. There is no further record of the case and no record of a microscopical examination. . . . In August, 1915, the patient noticed a painless nodule in the left breast. . . .

"*Course of Case.*—I removed the left breast and axillary contents with a wide area of skin and a wider one of deep fascia, together with both pectoral muscles. The supraclavicular glands were not removed. The pathological report was 'spheroidal-celled carcinoma with extensive infiltration of the axillary glands. In July, 1919, a colleague removed a recurrence from over the left fifth rib. In January, 1920, the left supraclavicular glands were apparently in the same condition as originally noted in 1915. X-ray treatment was carried out in August and September, 1920, and repeated in January, February, and March, 1921.

"In July, 1921, there was a hard mass of about ½ inch across, situated in the middle of the original scar of the operation on the right breast nearly 31 years before. Another small hard mass was felt in the right axilla. The right supraclavicular glands were not enlarged, but the left glands were larger and softer than before. There was no local recurrence on the left side. Thereafter there was little change externally, but signs of right pleural effusion developed and the patient died in October, 1921, aged 66, more than 31 years after the operation for carcinoma of the left breast."

In the case described in the *British Medical Journal,* cancer of the tongue was followed 34 years later by cancer of the stomach, while in the case described by the *Lancet* cancer of the right breast occurred 31 years after a successful operation for cancer of the left breast. It is perfectly conceivable that both cases resulted from chronic poisoning occurring during 20 years or more preceding the first operation, and that nature required an interval of more than 30 years to produce another outbreak, exactly as it possibly required 20 years or so for the first outbreak.

In the previous chapter I have tried to establish that cancer is apt to occur in people of advanced age, not because of the number of their years and of physical degeneration, but that there was merely "a coincidence" connecting advanced age and cancer. If, as I believe, the various poisons producing cancer lead, as a rule, to a cancer outbreak only in 20 or 30 years, it is perfectly obvious that it cannot be expected that cancer will attack the young. An explanation why, in a few cases, young children have cancer, will be given in Chapter XV, in which the question whether cancer is infectious or hereditary is discussed.

It seems to me that people of advanced years get cancer, not because they are 50 years old or more, but because the various poisons leading to cancer require 20 or 30 years to produce an outbreak of the disease. If my contention is correct, it follows that middle-aged and old people need not die of cancer provided that they avoid the cancer-creating

poisons. It follows that aged civilized people may be as free from cancer as are aged savages, that age can in no way be considered a direct, or a predisposing, cause of that infliction.

Some of my readers may be disappointed with this chapter. They may say: "We wished to know how ordinary cancers of the breast, uterus, stomach, bowel, etc., are caused, and how these cancers can be avoided. Instead of telling us all about these very frequent cancers, the author discusses at length X-ray cancer, radium cancer, arsenic cancer, aniline cancer, and so forth, which are so rare that they have little practical interest for the general reader." That argument is a fair one, and has to be answered.

I have begun my demonstration by discussing a number of cancers caused by various chemicals and by X-ray burns and other burns because these show most clearly the extraordinary character and genesis of the disease. Diseases, like plants and animals, have certain clearly defined habits of growth and of development. There are plants and animals which arrive at maturity in a day or two, and there are others which develop only after a very long number of years. Similarly, there are diseases which develop in a day or two, diseases which develop in two or three weeks, and there is cancer which develops apparently only in 10, 15, 20, 30, or more years. I have shown by the example of X-ray cancer, radium cancer, arsenic cancer, aniline cancer, paraffin cancer, and cancer arising from extensive ordinary burns, that the disease requires, as a rule, 20 or more years to develop.

If cancer requires 20 years or more of incubation by the factors named, we are entitled to assume that all the so-called ordinary cancers also develop only when the victim has been exposed to some cancer inciting poison, or poisons, during 10, 20, or more years. Consequently, if we hear that a woman has received a blow on the breast and that cancer appeared at the very point where the blow was delivered six months later, we ought to enquire: How did the woman spend the last 20 years? What poison or poisons was she exposed to? If we are informed that a woman developed cancer of the uterus "immediately after the change of life," we should enquire, in view of the information collected in this chapter, whether she did not absorb some poison or poisons during a great many years preceding the menopause. If we hear of a man falling a prey to cancer of the stomach or to cancer of the bowel immediately after some slight digestive trouble, we should not hold responsible a probably quite insignificant disturbance of which we know, but some chronic poison absorbed during 20 or 30 years of which we do not know.

In this chapter a few and relatively unimportant chemical poisons, which are at present known to be cancer generators, have been discussed. Probably there are a good many other chemical poisons which possess that quality without our knowing it. Not very long ago it was not known that arsenic, aniline, tar, crude paraffin, etc., could bring about cancer. In the course of a few decades one chemical cancer poison after the other has been brought to light,

and it may be that there are a great many other poisons which also may in due course be found responsible for bringing about this terrible disease.

Formerly men were taught that a considerable dose of arsenic caused death by poisoning, that smaller doses brought about a dangerous illness, and that very small doses were quite harmless and could safely be used for medical purposes. The examples given show that infinitely small doses of arsenic, applied on account of skin disease, though not large enough to give rise to even the slightest symptoms of arsenic poisoning, produce a particular and quite unusual form of cancer. At present we absorb every day irritant poisons of various kinds, especially chemical preservatives, and we are told by interested parties that the consumption of these poisons is "quite harmless." Possibly that may be true. However, there is the danger that these poisons may act cumulatively and produce cancer after two or three decades or longer, as does the absorption of arsenic in doses which were formerly considered to be absolutely safe. In two special chapters (numbers X and XI) chemical poisons in general and chemical preservatives and their relation to cancer will be considered.

The present chapter was written mainly with the object of showing that cancer is not brought about by a blow, or by irritation, or by old age, but that it is caused by the absorption of extremely small quantities of poison during a very long period of time. If small and often repeated doses of chemical poisons and small and frequently repeated burns by

X-rays are liable to bring about cancer, we are justified in concluding that cancer brought about by auto-intoxication, by bowel poisoning, which will be considered in the next chapter, is likewise the result of poisoning extending over two or three decades or longer.

The somewhat rare cases of cancer treated in this chapter are invaluable as test cases. They may be called experimental cancers on human beings. They furnish an analogy for cancers in general, and are a key to the great problem.

Having endeavoured to prove that cancer is caused in many cases by chronic poisoning with chemicals, X-rays, and other burns, I shall try to show in the two following chapters that the disease is frequently brought about by poisons which are created within our own bodies, by auto-intoxication resulting from constipation extending over 20 years or more. When both chemical poisons and bowel poisons have been dealt with, I propose to consider the effect of vitamine starvation in the genesis of cancer.

CHAPTER VII

Cancer is Due to Chronic Poisoning and to Vitamine Starvation—Proof that Cancer is Caused by Chronic Poisoning from the Bowels

In the preceding chapter I have shown by a very large number of examples that cancer, when brought about by chronic poisoning by means of arsenic, aniline, paraffin, X-ray burns, etc., usually appears only after 10, 20, 30, or more years of exposure to these poisons. We are therefore, perhaps, entitled to conclude that practically all cancers are due to chronic poisoning extending over a very long number of years. All the occupational cancers enumerated in the sixth chapter are of the greatest importance and value, inasmuch as they enable us to obtain very definite data as to the length of exposure to certain cancer-producing poisons which has preceded the outbreak of the disease, data which, of course, are lacking in individuals who are found to be suffering from one of the more usual types of the disease, for in their case the origin of the malady is obscure. If, as I think I may contend, cancer is due, in practically all cases, to chronic poisoning which has taken place during one or two decades or longer, what poison or poisons, then, are responsible for the great mass of ordinary cancers?

Both chemical poisons and poisons created within the human body will have to be considered. In the present chapter I propose dealing with the latter, about which we have a good deal of reliable information, while the former will be treated later on in special chapters devoted to chemicals and to chemical preservatives in their relation to cancer.

If we enquire to what poison or poisons the generality of cancer patients have been exposed during 20 or 30 years preceding the outbreak of the disease, the most obvious reply must be to auto-intoxication from the bowel. Apparently civilization and constipation go hand in hand. In primitive races constipation is practically unknown. In civilized people chronic and severe constipation, accompanied by auto-intoxication, commences frequently between the ages of 15 and 20. The cancer age is usually calculated to begin at 45. By that time a great many people have been suffering from chronic constipation and from chronic auto-intoxication during 20 or 30 years. We cannot wonder that the dangerous age for cancer begins when people have passed their fortieth year.

Although chronic constipation leads in innumerable cases to auto-intoxication and to evil consequences and illnesses innumerable, that trouble has hitherto been treated rather as a cause of merriment than as a serious matter which calls for the attention of the doctor and of the scientist. In 1884, Messrs. Cassell and Co., of London, published a large popular book entitled *The Book of Health*. It has considerably more than a thousand closely printed

pages, and the text runs to about 750,000 words. It is, I believe, the biggest popular handbook of medicine existing, and it was written by the foremost authorities of the time. It was edited by Sir Malcolm Morris, the eminent dermatologist, and the contributors were the following well-known men:—

Sir W. S. Savory, F.R.S.
Sir Risdon Bennett, F.R.S.
Sir T. Lauder Brunton, F.R.S.
Sir J. Crichton-Browne, F.R.S.
Sir James Cantlie.
Sir Frederick Treves.
Dr. James E. Pollock.
Dr. J. Russell Reynolds, F.R.S.
Sir Shirley F. Murphy.
Dr. W. B. Cheadle.
Dr. Clement Dukes.
Mr. Henry Power.
Mr. George P. Field.
Dr. John S. Bristowe, F.R.S.
Sir Charles S. Tomes, F.R.S.
Sir Malcolm Morris.
Sir Joseph Fayrer, F.R.S.
Sir Hermann Weber.

The list of contributors was a brilliant one. The subject-matter of the book was treated exhaustively by great specialists from every point of view. Long chapters are devoted to food, stimulants, dress, the care of the body, of the eyes, ears, throat, teeth, skin, etc., but constipation is practically not mentioned at all. At that time, and indeed until quite recently, doctors treated constipation perfunctorily with a pill or a draught, and considered it as a

triviality unworthy of their attention. Yet many experienced practitioners have told me that more than half the illnesses of the people are due to that cause.

Constipation plays undoubtedly a very important part in our lives. It is a most weighty factor influencing our health. The present age is the age of cancer and of constipation, and there is an obvious and an ominous connection between the two.

During the 10 years 1911-20 cancer deaths in England and Wales were distributed as follows among the various sites, according to the *Statistical Review of the Registrar-General*, 1923, pages 62 to 63:—

In the figures given, sarcoma deaths are included, but their number is relatively small. They account for about 10 per cent. of the total.

A glance at these most interesting figures shows that the large majority of cancers in men occur in the digestive tract, especially in the œsophagus, stomach, large bowel, liver, and gall bladder. More than 60 per cent. of men dying from cancer have that disease in or about the alimentary canal. Of the women who die of cancer, about 45 per cent. have it in the sites mentioned, while about 40 per cent. have it in the breast, the uterus and thereabout. These figures are highly significant. In most nations the incidence of cancer is similar to the incidence of that disease in England with regard to the sites where it occurs.

Long-continued constipation leads to chronic autointoxication, which frequently has the most serious consequences. I shall show the importance of con-

SITES OF FATAL CANCER (INCLUDING SARCOMA) DURING THE 10 YEARS 1911–20

	Male Deaths	Female Deaths
Lip	2,361	180
Tongue	10,114	1,009
Mouth and Tonsil	4,640	712
Jaw	4,946	1,658
Total	22,061	3,559
Pharynx	2,150	674
Œsophagus	12,059	3,850
Stomach	36,833	32,927
Liver and Gall Bladder	18,236	26,060
Total	69,278	63,511
Mesentery	194	380
Omentum	358	969
Peritoneum	623	1,457
Small Intestine	924	904
Cæcum	1,191	1,990
Hepatic Flexure	123	167
Splenic Flexure	277	299
Sigmoid Flexure	2,488	2,940
Colon (part unstated)	6,847	9,287
Intestine (part unstated)	7,053	10,387
Rectum and Anus	18,297	14,007
Total	38,375	42,787
Ovary and Fallopian Tube	—	5,493
Uterus	—	40,175
Vagina, Vulva	—	2,807
Total	—	48,475
Breast	302	39,930

SITES OF FATAL CANCER—*Continued*

		Male Deaths	Female Deaths
Rodent Ulcer		1,235	1,083
Other Skin Cancer	Face	1,378	935
	Nose	131	119
	Scalp	86	171
	Ear	379	107
	Penis (Scrotum)	1,749	—
	Other Parts	1,339	1,279
Total		6,297	3,694
Larynx		4,780	1,359
Trachea		69	25
Lung		2,505	1,593
Pleura		134	100
Heart and Pericardium		16	8
Parotid		636	293
Thyroid		345	989
Pancreas		3,291	3,065
Spleen		235	316
Kidney, Suprarenal		1,760	1,565
Bladder		5,476	2,311
Urethra		28	54
Prostate		5,077	—
Testes		928	—
Brain		624	557
Spinal Cord		88	82
Globe of Eye, Orbit		396	352
Lymphatic Glands		2,253	1,030
Bones (not Jaw)	Skull	263	223
	Spinal Column	403	407
	Rib, Sternum, Clavicle	422	315
	Pelvis	598	528
	Arm	274	209
	Leg	981	950
	Undefined	42	26
Neck		2,685	658

SITES OF FATAL CANCER—*Continued*

	Male Deaths	Female Deaths
Throat	428	101
Axilla	106	167
Mediastinum	1,813	1,037
Thorax	136	112
Pelvic Cavity	161	493
Abdomen	1,006	2,015
Groin	195	195
Other Localities	778	615
Multiple	290	395
Undefined	336	402
Total	39,558	22,547
Grand total	175,871	224,503

stipation and its relation to cancer in the first place by giving the testimony of Sir Arbuthnot Lane, the Consulting Surgeon of Guy's Hospital. He has the merit of having demonstrated to the world the dangers of habitual constipation, or of intestinal stasis, as he calls it. He has been a pioneer in this matter, and in various other things as well.

As I intend giving some considerable space to Sir Arbuthnot Lane's views, readers may ask: "Who is Sir Arbuthnot Lane, and what has he done? Why should a surgeon be interested in constipation, which is generally considered to be the province, not of the surgeon, but of the doctor?" Sir Arbuthnot Lane is an original thinker and an investigator. In the realm of surgery he has completely changed the method of treating fractures. Formerly broken arms and legs were put in splints and the healing

was left to nature. If such fractures healed well, all parties were satisfied. If they healed badly, men became cripples for life.

Before the advent of X-rays, surgeons could not inspect a fracture and see whether, if left to itself, it was likely to heal properly. Sir Arbuthnot Lane, grieved at the failure which so often followed treatment by the old methods, when simple means failed, did not hesitate to operate and to join the broken portions of the bone itself, if necessary by means of screws and plates, to the horror of his less enterprising contemporaries. His method is now generally followed in suitable cases. That great biologist, Sir Arthur Keith, stated in his book *Menders of the Maimed,* London, 1919, on page 159:—

"Arbuthnot Lane not only described a new method of treating fractures, but he enunciated an altogether new surgical standard. He saddled the surgeon, not Nature, with the entire responsibility of obtaining a perfect result in the mending of broken bones. He knew very well from his dissecting-room studies that Nature had an almost unlimited power of adapting living structures to new conditions. But why should the surgeon by his carelessness throw such a burden on Nature when, by a little foresight and a perfect reapposition of parts, he could make her task easy so that a final result was certain? . . .

"What are his principles?

"The first one—the perfect reapposition of parts—is the enunciation of a simple anatomical truth. Bones, joints, and muscles are so shaped and so fitted together that they work as parts of a perfect mechanism; the alteration of one part necessitates an alteration of all the parts. Perfect restoration permits the old machinery to be used without any alteration.

"The second principle applied in the operative treatment of fractures is a surgical one: the gap between the broken ends is treated as if it were an incised wound; edges are brought together, not by sutures, but by screws; the aim is bony union by first intention. The principle of rest is secured by fixation derived from screws and plates in place of outward splints and bandages. The essential feature of Arbuthnot Lane's treatment is the restoration of parts to their original relationships. The method implies immaculate cleanliness. In theory the method seems perfect; the surgeon is expected to give Nature every opportunity of effecting a perfect result. . . .

"Arbuthnot Lane really introduced a new principle—the principle of internal splints. Until April, 1894, surgeons sought to maintain apposition and immobilization of fragments by means of external splints. Arbuthnot Lane conceived the idea of internal splints."

Surgeons and physicians are conservative folk. Sir Arbuthnot Lane had to agitate for 20 years until his method of treating fractures was taken up by the surgeons of England and of the world. He has proclaimed the great importance of constipation, which he calls intestinal stasis, and the necessity of preventative treatment of constipation for about 20 years, and even now many members of the profession hesitate to accept, or even to consider seriously, the views which he has expressed in numerous books, pamphlets, addresses, etc. However, the number of Sir Arbuthnot Lane's disciples is rapidly increasing for the benefit of mankind.

Before giving Sir Arbuthnot Lane's views in his own words, I would describe the position of the big bowel and the serious consequences of habitual constipation in homely and quite untechnical language.

The big bowel rises in the right groin, running up perpendicularly to the margin of the ribs. Then it curves at almost a right angle and runs horizontally to the extreme left side to a point high up under the ribs, and from that spot it drops perpendicularly down into the left groin, whence it goes towards the exit. In other words, the big bowel has a shape roughly comparable to that of the framing of a door.

If it is heavily overladen with fæcal matter, one of two things may happen. In weak and flabby individuals the weight of the contents drags the bowel out of its position. It becomes dilated and elongated, loses its shape, and the patient begins to suffer from colitis, which means inflammation of the bowel, and its often very serious consequences. In strong and energetic individuals, Nature comes to the rescue and ties up the overweighted bowel by means of bands.

There is a tendency of the body to adapt itself to almost any position and condition. The bricklayer gets horny hands. The pack-carrier's spine adapts itself to the load by an appropriate curvature, and the soft cartilages of his spine become replaced by bone as hard as ivory. The bands whereby Nature supports the overweighted big bowel do excellent services for a time by holding it up in its door-frame-like position. Unfortunately, these bands have a tendency to contract with advancing years. These contractions pinch in the bowel, which begins to bear an aspect similar to that of a rubber tube which has been hung on a nail and has angulated

at the point of pressure. Thus one or several kinks are formed which obstruct and almost close the bowel.

Curiously enough, the existence of these kinks has been ignored until quite recently. The most important and the most dangerous of these kinks has been called by Sir Arbuthnot Lane "the first and last kink," because it is the first one which develops, and it is the last one on the line of the bowel, being nearest to the exit. It occurs in the left side of the abdomen at the place where the colon ends and drops down towards the anus.

The obstruction caused by the first and last kink, and by the other kinks as well, offers a physical obstacle to the passage of the fæces. They accumulate above the obstruction and become dry and hard through the absorption of the liquid by the bowel walls. At last Nature forces the hard mass through the kink or kinks, or, more likely, it is forced through by means of a purgative medicine. The violent propulsion of the hard mass through the obstructed part causes friction and damage. Often the hard fæces seriously damage the tough leathery skin of the exit. The soft mucous membrane of the bowel is, of course, far more easily damaged, especially if there are obstructing kinks. Poisonous matter from the fæces enters the system through the damaged bowel, and the continually renewed damage and absorption of toxic matter during a long course of years may at last cause a cancerous growth to form in the obstructed part of the passage. From thence

it is apt to spread towards the liver or other parts of the body.

There is a strange connection between a woman's bowel and her breast, a connection for which biological science has not yet found an adequate explanation. Long-continued constipation in women is very frequently accompanied by degenerative changes in the breast, in the very corner which is the favourite site of breast cancer.

Women suffer more severely from constipation than men, because their abdomens are larger, because they lead more sedentary lives, because they eat more sweets and other foodstuffs which favour constipation, and because they are more bashful than men. Therefore they readily suppress their need, with the result that they upset the automatic machinery of evacuation. While in vigorous men the overfilled big bowel is frequently supported by bands which eventually become harmful by producing kinks in the manner described, women and weak men do not readily develop these bands. In their case the big bowel often sinks down, becomes prolonged and enlarged, and chronic stagnation of the contents sets in, which leads to colitis, or inflammation, and to the formation of pockets which act as traps and as centres of putrefaction. Owing to this condition, poisonous matter is formed, which enters the system and is carried to various parts of the body. Thus both the breast and the uterus are apt to be infected, and degeneration sets in, which frequently culminates in cancer.

I would draw attention to the following most im-

portant fact. Until recently the knowledge of the mechanism of digestion and excretion was both fragmentary and vague. Only a little was known, knowledge being based upon the dissection of dead bodies and operations on living men and animals. The advent of X-rays has completely changed the position. Doctors and surgeons are no longer groping in the dark. They can give to a living man or a woman an opaque meal, such as a bismuth meal, and, by using the X-rays, can watch the way every mouthful is swallowed, how it is conveyed into the stomach, how the stomach propels it to the bowels, and how the bowels pass it along. Therefore the details given in the present chapter and in other chapters of the book relating to the process of digestion, etc., are scientifically exact and reliable. Moreover, medical men can, by means of the X-rays and of an opaque meal, ascertain the defects in the action of the digestive apparatus and of the bowels, and they can ascertain whether there are irregularities, such as a bowel occupying an abnormal position, and whether there are points of constriction along the alimentary canal, and whether there are other anomalies and conditions which will be described in the course of this chapter and elsewhere.

Now let us hear what Sir Arbuthnot Lane himself has to say on the subject. On the 18th October, 1923, he gave an address to the Physical Society of Guy's Hospital, which was reprinted in the *British Medical Journal* of the 27th October of that year, in which he stated:—

"At present surgery and medicine appear to be one hor-

rible melée of attempts to understand and treat end results, little or no endeavour being made to obviate the development of these conditions. . . .

"The profession is only just beginning to realize the enormous part played by the defective functioning of the gastro-intestinal tract, the consequent fouling of the food-supply, and the poisoning and deterioration of the tissues by septic material absorbed from the intestine. . . .

"Cancer is not recognized as a part of a mechanical sequence, and as never affecting a healthy organ, but is regarded as a primary condition. The cancerous cell will only grow in a suitable soil, and that soil is provided for by the prolonged action of toxins in the tissues. . . .

"It is the habit of civilization to regard a single formed motion a day as the normal, so that the individual is habitually constipated for at least 24 hours, and the products of the food consumed during that period are accumulated in the large intestine and in the first instance in its termination. Therefore strain is experienced first upon the outer layer of the mesentery, which fixes the iliac colon to the floor of the fossa, and this strain is greatest about the junction of the iliac and pelvic segment of the colon. Corresponding exactly to this strain there is developed upon the outer surface of the mesentery, extending from its base, streaks or bands of peritoneum, fibrous in appearance. These spread gradually along its outer aspect, and as they grow they contract and shorten this portion of the mesentery, so limiting the range of movement of the portion of intestine which it secures. Later this new growth of tissue, which is the crystallization of lines of force, extends to the outer wall of the large bowel and gradually encroaches on its circumference. Not only does it pin the intestine immovably in the fossa, but by its progressive attachment to the bowel wall it rotates it upon its long axis and reduces its lumen very materially, and consequently obstructs the passage of fæcal matter through it. The contents of this portion of the intestine are usually

firm and often hard, so that it is easy to realize how difficult it may be for the fæcal mass to negotiate this obstruction, even when it exists only in a moderate degree. Any interference with the free functioning of this portion of the bowel is a serious obstacle to efficient drainage, and the more marked the obstruction, the greater the delay of material in the entire gastro-intestinal tract proximal to it.

"To this particular obstruction I gave the name of the 'first and last kink,' the *first* because it is the earliest to form, and the *last* because it is the lowest in the gastro-intestinal tract.

"I cannot exaggerate its importance, as I believe its capacity for harm is tremendous and far-reaching, and that it is responsible for all the changes which are due directly and indirectly to chronic intestinal stasis. It spells the failure of civilization and is a veritable Pandora's box.

"Consequent on the stagnation of material in the large bowel, similar bands develop along the mesentery, securing the convexity of the loaded colon. These are most marked in certain situations, such as the splenic flexure, and again at the end of the ileum, where it is called the ileal kink. The secondary accumulation of material in the small intestine angulates the duodeno-jejunal junction, causing first dilatation of the duodenum, and later ulceration of its first portion, spasm of the pylorus, dilatation of the stomach and its ulceration along the seat of strain, namely, the lesser curvature. This ulceration of the stomach tends readily to become cancerous.

"The same tendency to the development of cancer occurs in the large bowel where angulated and obstructed by acquired bands, or by spasmodic action of the sphincter ani or of Mayo's circular band of muscle, in direct proportion to the degree of obstruction and to the increase in consistence of the fæces. The stagnation of the contents of the large bowel also causes an inflammation of the appendix, which is frequently anchored and obstructed by acquired adhesions of the mucous membrane of the colon,

producing colitis in its various degrees and forms. The appendix is often so secured as to control the ileal effluent and to increase the stagnation of the material in the small intestine.

"Its Toxæmic Results.

"Besides these mechanical results of stasis, the sequences of which are quite obvious, we have those which are consequent on the fouling by organisms of the dammed-up contents of the small intestine, duodenum, and even the stomach, with the extension of the infection along the hepatic and pancreatic ducts, which produce gall-stones and cancer. The mode of the extension of the infection in these is as apparent as the mechanical changes. The next series of changes we have to consider are those which come about by the absorption of the infected contents of the gastro-intestinal tract of more toxins, etc., than the liver is able to deal with. These noxious substances getting into the circulation are carried away to every organ and tissue in the body, and produce disastrous results in proportion to the degree of the toxicity of the blood.

"The degenerative changes in the thyroid, adrenal, and other ductless glands, the heart and blood vessels, the nervous system, the eyes and ears, the kidneys, liver, pancreas, uterus, ovaries, testes, prostate, breast, fat, skin, hair, lymphatic tissue of the naso-pharynx, and the gums and teeth, these last two being the most frequent and conspicuous of all, I have frequently described in detail, and I have shown how liable certain of these degenerated organs, as the breast, uterus, ovary, and pancreas, are to be infected with cancer. Among the nervous symptoms may be mentioned intense headache, neuritis, neuralgia, sleeplessness, misery, complete mental and physical prostration, melancholia, epilepsy, disseminated sclerosis, delusions, dementia præcox, etc.

"Besides these changes, which are the direct result of the supply of toxic blood to the tissues, we have a number of infections which occur because of the inability of the

degenerated tissue to withstand their inroad. These infections are all of such a nature as not to be able to obtain a foothold in a normal healthy subject.

"Cancer Never Affects a Healthy Organ.

"Perhaps the most conspicuous at the present moment is cancer. Cancer never affects a healthy organ. In every case in which I have had an opportunity of verifying it, I have found that the cancer patient was suffering from chronic intestinal stasis, and that the infection by cancer was an indirect consequence of this condition. Cancers of the skin and tongue which are produced by chronic traumatism alone are not included in this category. If this assumption is correct, it is obvious that, to prevent the development of cancer, it is necessary to obviate these changes, which result in the gastro-intestinal tract from the diet and habits of civilization. . . .

"Cancer is the final stage in the sequence of chronic intestinal stasis. It is the last chapter in the story of defective drainage of the large bowel as it is in the rest of the gastro-intestinal tract."

In the English monthly *Health* for November, 1923, there is an address by Sir Arbuthnot Lane, in which he deals with the subject of stasis, or chronic constipation, as follows:—

"Civilization brings into being an additional and very serious factor, namely, constipation. This arises in the first instance from the inability of the mother to provide the necessary nutriment during infancy, from the diet of civilization, and from the habit of regarding a daily action of the bowels as being sufficient for health. Women are at a great disadvantage compared to men, since their abdomens are much longer in order to accommodate their offspring, and their pelves are wider to permit of its exit.

"We have, therefore, two abnormal factors at work in

these circumstances, namely, constipation and gravity. Constipation means a damming back of the contents of the large bowel, then of the small intestine, the doudenum, and last of the stomach. In consequence, the intestinal canal becomes dilated, and later, at points of pressure or stress, ulceration and finally cancer develop. The second and perhaps more important result of the stagnation is an invasion of the contents of the small intestines by organisms which are normally confined to the large bowel. The food-supply of the individual upon which nutrition depends becomes infected by poisonous materials produced by organisms, and from this portion of the intestinal canal an enormous amount of deleterious matter is absorbed into the circulation. An excessive strain is thrown upon the liver, kidneys, and other organs, which fail to perform their functions efficiently and undergo destructive changes. Poisoning of every tissue in the body produces rapid degenerative processes in them which are regarded as separate diseases. This auto-intoxication later lowers the vitality of all the structures in the body, so that they are no longer able to resist the inroad of organisms, which can therefore establish a foothold in them, and diseases, such as rheumatism, gout, tubercle, cancer, and a host of other complaints, arise. These could not develop in an individual whose digestive processes are perfectly normal, and, with the exception of cancer, they are cured by the effectual sterilization of the contents of the stomach and small intestine. If the contents of the stomach and small intestines are free from deleterious organisms, the material that is obtained from the chyme and carried into the circulation affords the most perfect nutriment for the cells of the body.

"If the main sewer of a town is obstructed, all the houses draining into it are affected. The several organs and structures of the human body occupy an analogous position to the houses of the town, and suffer correspondingly when the drainage scheme of the body is obstructed and infected, and changes take place in them which are called diseases.

"It is interesting to note that savages do not suffer from indigestion, appendicitis, duodenal or gastric ulcer, colitis, or cancer in their normal surroundings, but when placed in civilized conditions they acquire these diseases as readily as white people.

"Women, owing to the mechanical disability already alluded to, suffer from constipation, and die of cancer almost twice as frequently as men.

"Deaths from cancer are increasing at the rate of 2.5 per cent. per year. What interests us particularly is the methods that Nature adopts to obviate the effects of the stagnation of the contents of the bowels and the action of gravity increased by their abnormally loaded condition. This it does by the enormous and progressive elongation of the large bowel in the feebler subject, or in the more vigorous subject by the formation of membranes or accessory ligaments which help to support the weight of the overloaded intestines. They are most developed at the points of greatest stress. At first these adventitious structures serve a very useful purpose. Later, however, they contract as they become stronger, and by the strain exerted by them upon the bowel they obstruct its lumen and control the passage of the intestinal contents."

Sir Arbuthnot Lane's arguments are no doubt very impressive. However, the discriminating reader will ask: "Does Sir Arbuthnot Lane stand alone in his views, or is he supported by a number of experienced men, specialists and others?"

In order to allay any doubt which may exist in the minds of those who have followed the reasoning which runs through the long quotations given, I would now show that a large number of eminent specialists have either become Sir Arbuthnot Lane's disciples, or have more or less independently arrived at the conclusion that chronic constipation is likely

to lead, by way of chronic laceration of the bowels and chronic auto-intoxication, to that dreadful malady cancer.

Dr. A. C. Jordan delivered in December, 1920, the presidential address on "Stasis and the Prevention of Cancer" before the Hunterian Society. It was reprinted in full in the *British Medical Journal* of the 25th December of that year. He impressively described the genesis of cancer of the bowels, stomach, liver, gall bladder, etc., from chronic constipation, as follows:—

"If careful enquiry be made into the history of patients with stasis, its commencement can usually be traced to the first years, or even weeks, of life. Many of the patients have been constipated and 'bilious' since early childhood. In youth the tissues can resist disease. An X-ray examination of healthy young men (medical students, members of a hospital football team) was carried out some years ago, bismuth meals being given with the object of establishing the 'normal.' The investigation yielded the surprising result that many of these robust, healthy youths had the colon prolapsed, the transverse colon hanging below the pelvic brim. . . .

"In chronic intestinal stasis active pathogenic bacteria thrive in the bowel; these form poisonous products in the intestines, which are carried by way of the thoracic duct into the general circulation, and thus reach every living cell of the body. No tissue or organ can resist their baleful influence; every tissue attacked by them loses some of its power of resisting pathogenic influences, and this lowered resistance has a very potent influence in favouring the occurrence of cancer. . . .

"X-ray investigation shows that chronic catarrh of the large intestine is an extremely frequent condition in stasis. It occurs early in the course of the disease, and is obstinate

to treat. The mucous membrane is slow to recover and is apt to relapse under slight provocation. This 'catarrh' is called 'colitis,' and is classified, according to its severity, as 'mucous colitis.' In the more advanced and chronic stages, although there may be no definite ulceration, there is always erosion of the mucous membrane. In fact, the mucous membrane is in a condition which encourages the occurrence of malignant change. . . .

"The danger of cancer arising in the large intestine where bands and sharp angulations have formed is enhanced by peristaltic efforts to overcome the obstruction caused by these bands and kinks. Sir Arbuthnot Lane has pointed out that a feeble organism makes no attempt to resist the fall of the viscera, and makes little propulsive effort to thrust the fæces through the large intestine. To this extent, therefore, a robust person is more liable to suffer from cancer of the large intestine than a feeble one, for the robust man develops bands which form obstacles, and then his bowel makes strong propulsive efforts to overcome these obstacles. Thus the kinked portions of his bowel are subjected to a far greater mechanical strain than the mobile large intestine of a feeble woman. . . .

"The contents of the small bowel are liquid and do not produce the same mechanical pressure and friction on the lining membrane of the bowel as the solid fæcal masses contained in the large intestine. In severe cases of stasis the lower coils of the small intestine teem with pathogenic microbes, and poisonous toxins are absorbed into the system through the mucous membrane of the small intestine, yet the microbes are not in continual contact with eroded portions of the mucous membrane of the bowel. . . .

"From these considerations we are led to expect that cancer is of unusual occurrence in the small intestine, and experience proves this to be true. . . .

"In the stomach the conditions are very different from those which exist in the duodenum. Duodenal distension causes spasmodic closure of the pylorus, which prevents the

regurgitation of the contents of the distended duodenum, and keeps back the gastric contents, so that they shall not increase the duodenal distension. This pyloric spasm is found, from X-ray experience, to be very persistent. . . .

"The stomach cannot always evacuate its contents in the normal time, despite the abnormally strong gastric peristalsis, for the waves cannot overcome the pyloric spasm; the stomach becomes overfilled, and the greater curvature drops. The lesser curvature is then subjected to abnormal strain, its mucous membrane becomes congested, and an ulcer is liable to appear on the lesser curvature. Experience has taught us that an ulcer of the lesser curvature is very difficult to treat successfully. The ulcer becomes chronic, its walls become raised and indurated, and the way is prepared for a malignant growth. . . .

"In more advanced cases the position of the original chronic ulcer can still be made out, but in far advanced cases of cancer of the middle portion of the stomach the skiagrams show so irregular an outline that they no longer reveal the form of the chronic ulcer. When this advanced stage has been reached, the cancerous growth probably occupies a large area of the stomach, where it extends to the cardiac orifice, and where it may give rise to œsophageal obstruction. . . .

"A well-known physician recently wrote in the journal of his hospital somewhat as follows: 'Cancer of the stomach comes generally "out of the blue" with no preceding history of gastric trouble.' . . .

"I can scarcely recall or find notes of a single case which supports the notion that cancer ever comes 'out of the blue.' The patient may have become accustomed to his disorder, or make no complaint of it, but careful enquiry elicits, in nearly every case, a lifelong history of constipation, flatulence, and biliousness. Radiological investigation reveals incontrovertible evidence of long-standing disorder. . . .

"Opening into the upper end of the intestinal canal are

the ducts of the pancreas and the liver. Stasis, as already shown, causes distension of the duodenum. As the stasis becomes more pronounced, the congestion and infection of the duodenum extend into the orifices of the pancreatic duct and the bile ducts. Chronic pancreatitis results, and may end in cancer. The gall bladder in its turn becomes distended from congestion of the mucous membrane of the bile ducts. Chronic catarrh of the gall bladder is set up, mucus is secreted, and in many cases gall-stones are formed. As the result of infiltration and infection of the mucous membrane, or from erosion due to the long-continued irritation of gall-stones, cancer of the gall bladder or the bile ducts may occur.

"The liver, through the portal system, receives toxins in large quantities from the infected intestines, and is bound to suffer like the pancreas. Wherever we look we see the havoc wrought by stasis and the damage done by circulating toxins. The alimentary tract is doubly vulnerable, for not only is it exposed to direct attack by the pathogenic bacteria in the bowel, and the irritant contents of the intestines, but the bowel wall is a victim of the destructive action of the circulating poisons, and is abnormally vulnerable. . . ."

In the opening pages of his book *Chronic Intestinal Stasis: A Radiological Study,* London, 1923, Dr. Jordan wrote:—

"All mammalian animals retain fæcal matter in the large intestine, and are subject to some amount of intestinal absorption. The large intestine is much better developed in herbivorous than in carnivorous animals, and has a very wide calibre. In herbivora, the large intestine retains numerous microbes which are able to destroy the cellulose walls of the vegetable cells of which their diet is almost wholly composed. Cellulose resists the action of the intestinal ferments, and herbivora would be unable to digest

their food without the aid of the bacteria which dwell in their intestines. These bacteria enable the intestinal juices to surround the proteins of the vegetable cells after their protective cellulose envelope has been destroyed by microbes. In carnivora, this function of the large intestine is called into play in a much less degree. Reptiles and amphibia do not require a voluminous large intestine. They are 'cold-blooded,' and in consequence are small eaters. . . .

"Constipation is fostered in many ways. An infant, like the lower mammals, evacuates its bowels whenever the rectum contains an amount of fæces sufficient to excite the reflex act of defæcation. As soon as practicable the 'education' of the child is inaugurated by a systematic attempt (by mother or nurse) to prevent the child responding to the natural demands of the bowels. The child learns to be constipated. School life fortifies the teaching of the nursery, for a child who frequently asks permission to 'leave the room' is looked upon with suspicion by his teachers. Throughout civilized life the call of the bowels for relief is subjugated to the interests of convenience or expediency. . . .

"The intestinal stagnation gives rise to a definite train of clinical disturbances, while the toxæmia, or poisoning of the circulating blood by the products of bacterial action, affects every tissue and organ of the body. Many of the symptoms and signs of stasis are due to derangement of the ductless glands and other organs. So interwoven are the effects that it is impossible to devise a complete logical classification of the symptoms and physical signs of chronic intestinal stasis.

"Derangements due to the direct effect of intestinal stagnation are constipation, flatulence, distension, abdominal pain, abdominal tenderness (general or localized), and colic. Appetite is poor or capricious. There may be nausea; the breath is foul, and there is a bad taste in the mouth.

"In advanced stages, the bowel wall is affected by the general toxæmia, the mucous membrane becomes catarrhal, and the constipation gives place to a form of diarrhœa in which mucus is voided with small amounts of fæcal material.

"Some of the symptoms of early stasis may be said to be due to uncomplicated toxæmia, though none can say when derangement of one or other of the ductless glands begins to enter the picture. These early symptoms include headache, backache, muscular pains and aching joints, neuralgia and neuritis; attacks of asthma occur in some cases. All the early symptoms enumerated above are intermittent at first, but become more persistent as the disease progresses.

"As the disease gains a firmer hold on its victims it gives rise to a train of mental disturbances, covering the whole range of intensity from lassitude and sexual inertia to delusional insanity. The catalogue includes depression, want of energy, lack of concentration, loss of memory, and neurasthenia. Sleeplessness and bad dreams are common complaints. Serious mental disturbances include epilepsy, imbecility, melancholia, and suicidal mania. In three instances in my practice acute depression ended tragically in suicide.

"The physical signs of stasis are very constant and definite. The skin is sallow, fatless, and inelastic; it is stained, the brown coloration commencing in the regions where pigment is present normally, i.e. the eyelids, the axillæ, and the back of the neck. The sweat has an unpleasant odour. The hair of the head falls out. This is due to the general toxæmia, for the impaired nutrition of the tissues of the scalp allows microbes to invade the roots of the hairs. . . .

"Pyorrhœa occurs in toxic gums, and leads to infection of the roots and sockets of the teeth. Rheumatic swelling of joints and rheumatoid arthritis occur from secondary infection of the toxic joint tissues by micrococci. Suppura-

tion at the roots of teeth increases the liability of the joints to these secondary infections.

"There is general wasting and softening of the toxic muscles and ligaments of the body. In young subjects the lack of muscular support of the joints leads to spinal curvature, flat foot, and other deformities. Over-extension of the joints is usual in 'toxic' children. The thumbs are 'double-jointed,' the fingers and wrists can be bent back to an abnormal extent; the elbows can be overextended.

"In older subjects, the ciliary muscles of the eyes weaken, the lens hardens, and so accommodation fails. There is general loss of fat, leading to prominence of the bones, wrinkling of the skin, and an appearance of premature senility. The mammæ become pendulous. The skin of the abdomen and of the buttocks hangs in folds. These changes contribute to the appearance of premature old age.

"The viscera lose their fatty support; the kidneys drop, and the uterus falls back upon the rectum."

Elie Metchnikoff, the celebrated successor of Pasteur, came to the same conclusion as Sir Arbuthnot Lane with regard to the consequences of chronic constipation, although he argued on somewhat different lines. We read on pages 42, 69 and 71 of his book, *The Prolongation of Life,* 1907:—

"Although there still remain several open questions with regard to the mode of infection by way of the intestine, yet no doubt remains as to the very great importance of this gate of entry. It is very probable that in many diseased conditions which one is wont to attribute to intestinal intoxication, an infection of the blood by intestinal microbes, more especially the Bacilli coli, has really taken place, these microbes having invaded the body tissues through the walls of the bowels.

"The entirety of these results, which have been accumulated by science, prove that the intestinal wall is worthy

of being made the subject of most careful hygienic consideration. . . .

"The ill-health which follows retention of fæcal matter is certainly due to the action of some of the microbes of the gut. There are difficulties, however, in determining the precise mode of action of these microbes. It is generally believed that they form poisonous substances which are absorbed by the walls of the intestine, and so pass into the system. The phrase auto-intoxication, as applied to infants, women in labour, and patients affected with diseases of the heart, liver, or kidneys, is based on this interpretation of the morbid processes involved. . . .

"Not only is there auto-intoxication from the microbial poisons absorbed in cases of constipation, but microbes themselves may pass through the walls of the intestine and enter the blood. In the maladies that are the result of constipation some of the symptoms recall those of direct infection, and it is highly probable that, if special investigations were made, microbes of intestinal origin would be found in the blood of the sick children and the pregnant or parturient women whose symptoms I have described above.

"The question as to the passage of microbes through the intestinal walls is one of the most controversial of bacteriological problems, and there is little agreement in the numerous publications regarding it. None the less, it is far from impossible to get a general idea of what goes on in an intestinal tract richly charged with microbes.

"Although the intestinal wall in an intact state offers a substantial obstacle to the passage of bacteria, it is incontestable that some of these pass through it into the organs and the blood. Numerous experiments performed on different kinds of animals (horses, dogs, rabbits, etc.) show that some of the microbes taken with food traverse the wall of the alimentary canal and come to occupy the adjacent lymphatic glands, the lungs, the spleen, and the liver, whilst they are occasionally found in the blood and lymph.

Discussion has taken place as to whether the passage takes place when the wall of the gut is absolutely intact, or only when it is injured, to however small an extent. It would be extremely difficult to settle the question definitely, but it is easy to see that it has little practical bearing. It is known that the wall of the gut is damaged extremely easily."

As I wrote in another part of this book, I would rather that my readers should be wearied but convinced than that they should be entertained but not convinced. In order to show that the views of Sir Arbuthnot Lane, of his disciple, Dr. Jordan, and of Elie Metchnikoff, are correct, I intend to call for witnesses a considerable number of medical experts.

Mr. H. C. Ross, of the Lister Institute, stated in the *Journal of Cancer Research* in 1918:—

"It is useful to remember that carcinoma seems more frequent in general at sites which are continually subjected to organic matter undergoing bacterial decomposition, such as the rectum, stomach, and indeed the whole intestinal tract, mouth, uterine cervix, breast, prepuce, anus, scrotum, etc."

The well-known surgeon, Mr. J. Lockhart Mummery, the head of the British Empire Cancer Campaign wrote in his book, *Diseases of the Rectum and Colon,* 1923:—

"Cancer of the large bowel appears to be commoner at those points at which any special friction in the contents is liable to take place. At least this would appear to be the explanation of some of the facts.

"A patient who was recently in St. Mark's Hospital, a man aged 60, with a congenital megacolon, in which the

dilation of the colon extended to the anus, was found to have an adeno-carcinoma just above the anal canal, which, it appeared, was due to the friction produced by the large mass of fæcal contents in the dilated colon.

"A case was recorded by Lockwood in which the descending colon was doubled, and at the site of the junction of the two tubes cancer had developed. Cancer certainly seems to be commoner at the recto-sigmoid junction, where one would imagine a certain amount of friction tends to take place."

Dr. Samuel Goodwin Gant stated in his work, *Diseases of the Rectum and Colon* (W. B. Saunders Co., 1923) :—

"Continued irritation and trauma are, in the author's opinion, most significant predisposing causes of cancer in the rectum and elsewhere, examples of which are epithelioma of the lip in pipe-smokers, scrotum in chimney-sweeps, hands in X-ray specialists, paraffin and wax workers, and carcinoma of the breast, rectum, and cervix, the rectum being frequently bruised during defecation and cervix lacerated during labour.

"Malignant disease and changes seldom result from a single, but often follow continuous or repeated, insult to a definite structure, evidence of which is found in the fact that intestinal cancer nearly always occurs at the anus, sigmoid, hepatic, or splenic flexures—segments of gut most often traumatized, by passage of the fæces or expulsion of impacted scybalæ or foreign bodies.

"Repeated trauma leads to congestion and breaking the epithelial covering of the involved part, which opens an ideal focal point for entrances of parasites, bacteria, toxins, or the irritant responsible for malignant disease. . . .

"Malignancy often develops at the site of gastric, duodenal, and rectal ulcers, the cervix and vicinity of fistula, wounds and points dominated by cicatricial tissue,

probably owing to the fact that scar tissue poorly nourished harbours bacteria, factors interfering with the mesodermal elements."

Mr. F. Swinford Edwards told us in his book, *Diseases of the Rectum, Anus, and Sigmoid Colon* (J. & A. Churchill, 1908), page 263:—

"Malignant disease affecting the intestines is most commonly situated in the rectum. . . .

"Carcinoma of the rectum rarely occurs before the age of 40, and although I have seen several cases under 30, each of these was a rapidly growing and highly malignant type. It is more prone to occur in males than in females. Hæmorrhoids, fistula, and fissure of the rectum probably form predisposing factors to the development of cancer in the anal region. I can call to mind several instances of villous tumour of the rectum subsequently undergoing malignant changes, and I have had under my care a case of malignant adenoma which appeared to start from a pre-existing fistula; whilst two cases of epithelioma of the anus certainly originated in fissure."

Drs. Joseph E. Adams and Maurice A. Cassidy stated in their book, *Acute Abdominal Diseases* (Baillière, Tindall & Cox, 1913), on pages 191 and 202:—

"Concerning the etiology of intestinal cancer, little is known beyond the fact that the commonest situations are those where irritation is likely to play a part in the causation. Thus growths are most often encountered in the cæcum or at the flexures of the colon, all places where some degree of fæcal stasis is common.

"As in the case of carcinoma of the colon, superadded inflammation, fæcal impaction, or intussusception often determines the onset of acute obstruction, but chronic obstruction is usually present for some time first, and is

exemplified, especially in catarrhal changes above the structure and the decomposition of arrested fæcal matter. Bleeding from the ulcerated surface of the growth is common, and 'symptomatic piles' are often met with. Dilatation ulcers, especially of the cæcum, are frequent in association with rectal cancer."

The celebrated American surgeon, Mr. William J. Mayo, stated in the 4th volume of the *Mayo Papers,* page 711, published in 1913:—

"In cancer of the large intestine, the irritation caused by material which has escaped into small mucus pockets or diverticula, exerts a chronic irritation, which is one of the rather frequent determining factors in the causation of cancer of the colon."

In his book, *On Means for the Prolongation of Life,* by Dr. Sir Hermann Weber, London, 1914, we read on page 153:—

"Constipation is a frequent cause of colitis, and it may also give rise to more serious organic disease of the intestines; the irritation which the hard fæcal matters exercise on the mucous membrane of the colon and rectum is, in some persons, one of the probable causes of cancer."

The eminent French surgeon, Dr. Victor Pauchet, told us in *Le Colon Homicide,* published in Paris in 1922:—

"The principal cause of constipation lies in the bad training of the bowels. On the day when the baby is taught going to stool it is taught how to be constipated. A child ought to go and evacuate whenever it feels the inclination, which means three times or so per day. As

soon as a child is taught to retire only once a day, constipation begins, and becomes progressively noticeable when it goes to school. When going to school the mother takes good care that the child should take his breakfast, and the first meal is, as a rule, taken too rapidly, but few mothers are aware that filling the child's stomach is far less important than emptying the child's bowels. It is a mistake to believe that a single evacuation per day is normal. Savages empty their colon several times a day. . . .

"When a woman complains that she has pain or a tumour in the breast, study the condition of her bowels by means of X-rays. In the majority of cases, lesions of the breast are of intestinal origin. The regular evacuation of the bowels is often sufficient to bring back the breast to normality. I have found that in cases of cancer of the breast nine women out of every ten suffering from this disease were constipated. If they had been warned against constipation 10 or 15 years before, they would never have suffered from tumour of the breast or from cancer."

Ulcers of the stomach are a most fruitful source of cancer of the stomach. The one often leads to the other. According to Sir Arbuthnot Lane, chronic constipation, by blocking the drainage system, leads to infective developments first in the small bowels and then in the stomach, which is apt to become ulcerated. Now, gastric ulcers seem to offer a most favourite soil for cancer growths. That eminent surgeon, Mr. A. J. Walton, told us in *A Text-Book of the Surgical Dyspepsias* (Edward Arnold & Co., 1923), on page 234:—

"The possibility of carcinomatous changes arising in the site of a chronic gastric ulcer was first discussed by Cruveilhier in 1839, and by Rokitansky a year later. The earliest statistics, such as those of Osler and McCrae, show a rela-

tively small proportion—four out of 150 cases—with a previous history of such an ulcer. These figures were somewhat similar to those of Friedenwald, who found that such a direct history was only present in 7 per cent.

"Since that time a large amount of evidence has been accumulating to show that this relationship is much more common than was previously thought. Sir Mayo Robson found that there was a previous history of ulcer in 57 per cent. of the cases, and Sir B. Moynihan that two out of every three cases of carcinoma had such a previous history. Mansell Moullin had a somewhat similar experience, for in his series there was a positive history in 60 per cent. of the cases. Wilson and MacCarty place the percentage as high as 71, while Mayo, in a series of 216 cases reported by MacCarty, found that as many as 79 per cent. showed this evidence of ulcer. Mumford and Stone investigated the question from the other aspect. They traced 60 patients treated for chronic indigestion who subsequently died, and found that in 50 per cent. the fatal termination was due to the onset of carcinoma.

"That there is a very grave danger of a chronic gastric ulcer becoming carcinomatous must be regarded as proved, but all would not agree that the relationship is so common. Paterson has returned to the older view that gastric ulcer is not so frequently a precursor of carcinoma. He suggests that the long-continued symptoms may have been due to a slow-growing tumour, and he quotes cases in which the symptoms have persisted up to 4½ years. My own series show that of 150 cases there was definite evidence of an ulcer in 45. In some of these the evidence was confirmed by pathological examination. In others there was a long history, perhaps dating back from 10 to 12 years, and in one even for 30 years, which in the early stages was characteristic of gastric ulcer."

In vol. 2, page 624, of Wolff's monumental work, *Lehre von der Krebskrankheit,* we read:—

"Different authors give different accounts of the frequency with which ulcer of the stomach turns into cancer. Haeberlin gives the percentage of cancers of the stomach arising from ulcers as 7 per cent., Rosenheim arrives at the same percentage, Hauser gives 9 per cent., Gluzynski 8.4 per cent. Boekelmann states that nearly half of all cancers of the stomach are due to ulcer, while Zenker states that all cancers of the stomach are due to ulcer."

On page 23, vol. 12, of the *Mayo Papers*, published in 1921, we find an article, "Chronic Gastric Ulcer and Gastric Carcinoma," by W. C. MacCarty, in which the author expresses the following interesting opinion:—

"Chronic gastric ulcers larger than 2 cm. in diameter are usually but not always carcinomatous. . . .

"Every patient harbouring a chronic gastric ulcer has the possibility of also harbouring a carcinomatous gastric ulcer. . . .

"The great and important practical questions are: (1) Is gastric carcinoma associated with chronic gastric ulcer? (*Answer*) Yes. (2) Is the association of the two conditions sufficiently frequent to be of importance? (*Answer*) Yes. (3) Can we state always clinically positively whether a gastric ulcer is or is not carcinomatous? (*Answer*) No. (4) At exploration can we always state grossly whether a gastric ulcer is or is not carcinomatous? (*Answer*) No. (5) Without the power of always grossly differentiating simple chronic gastric ulcer from the carcinomatous ulcer, and positively knowing that a chronic gastric ulcer actually exists, what positive logical practical advice can be given? (*Answer*) Consider the possibility of a chronic gastric ulcer being carcinomatous; excise or resect the ulcer and submit the specimen to a well-trained surgical cytopathologist."

On pages 275 and 311 of his book, *Duodenal Ulcer*

(W. B. Saunders Co., 1912), that eminent surgeon, Sir Berkeley Moynihan, stated:—

"In the great majority of the cases a healthy margin of the bowel lies between the ulcer and the pylorus, but the lesion may extend up to, or may even transgress, the pylorus. It is interesting to know that when it does so, the gastric margin of this ulcer may be, as Dr. W. J. Mayo has shown, the starting-point of a carcinatomous growth. The occurrence of a malignant change in a duodenal ulcer is extremely rare; in only two cases have I seen it. The change from a simple to a malignant form in gastric ulcer is, of course, not very infrequent; it would appear that approximately two cases in three of cancer of the stomach have their origin in an open chronic ulcer or in the scar of a partially or completely healed one. Ulcus carcinomatosum in the duodenum must be excessively rare.

"The recurrence of the 'attacks' in duodenal ulcer may be due to the healing and the breaking down, often repeated, of a solitary ulcer; or to the development of new ulcers. It is certain that the former is of far greater frequency than the latter, for it is not in more than 10 to 20 per cent. of the cases that more ulcers than one can be seen. In this statement there is, however, a source of fallacy, for the large ulcer, which is not seldom found, may have been due to the merging of one small ulcer with another, and these into a third and so on. That this is possible seems clear from the close proximity that the small scars of healed ulcers sometimes bear to one another. . . .

"We are new well informed of the fact that chronic ulcer of the stomach in a certain proportion of cases leads to the development of malignant tissues. Cancer of the stomach would appear to begin in connection with a chronic ulcer in something over 60 per cent. of cases. This is the estimate given by W. J. Mayo as the result of the examination of a large number of specimens removed during the operation of partial gastrectomy, and it coincides with that

which has been made by other observers on both clinical and pathological grounds."

A very able surgeon, Mr. E. G. Slesinger, had in the *Medical Press and Circular* of London a paper entitled "The Relation of Chronic Intestinal Stasis to Cancer." It appeared in 1922, and on page 293 we read:—

"The evidence in favour of the view that cancer does develop in the site of gastric ulcers has steadily grown since Cruveilhier and Rokitansky first put forward that view.

"Mayo Robson found a history suggestive of ulcer in 59 per cent. of the cases he operated on, Moynihan in 60 per cent., and Sherren in 31 out of 87 cases, while Wilson and MacCarty found naked-eye and microscopic evidence of the same thing in 71 per cent. of 153 cases they examined.

"Cancer of the colon is just as striking, if looked at from this point of view. The nature and situation of the resistance bands as developed in connection with the colon in chronic intestinal stasis have been described too often to need repetition, but certain facts require to be mentioned in following out the above argument. The first band to form in this disease, and very often that most fully developed, is the one in connection with the sigmoid colon, to which Sir Arbuthnot Lane gave the name of 'the first and last kink,' in that it is the first to develop and the last along the course of the bowel. This kink is the site of greatest obstruction to the passage of the colon contents in many cases, and the mechanical trauma involved in the efforts of the proximal bowel to drive the contents past it must be considerable. Cancer of the colon occurs with greater frequency at the site of this kink than anywhere else in the colon.

"After the last kink, the best developed bands are those which form on the outer side of the cæcum and ascending colon, fixing that part of the bowel, and because of their

attachment to the front of the gut distorting its lumen. The second most frequent site of cancer of the colon is in the situation of these bands. Again, in cases of chronic intestinal stasis, it is far more frequently found that the splenic flexure is obstructed by resistance membrane than the hepatic, and cancer of the colon shows similar preference."

Dr. Adolf Strumpell wrote in the 24th Edition of his classical *Lehrbuch,* vol. 1, page 651, under the heading "Cancer of the Stomach":—

"Very remarkable is the inter-relation between cancer of the stomach and other stomach troubles which have previously occurred. . . .

"Particularly important is the fact that cancer of the stomach arises not infrequently on the margins of a previous ulcer of the stomach. We have observed a large number of cases to confirm this, and have had additional proof relating to the origin of cancer from dissection after death. I can only express my surprise that the inter-relation between ulcer and cancer of the stomach is doubted by some recent observers."

Dr. A. J. Ochsner, the eminent American surgeon, stated in the *Journal of the American Medical Association* on the 25th September, 1915, in an article, "The Relation between Gastric Ulcer and Cancer":—

"Most surgeons with a very large experience in the operative treatment of gastric ulcer and cancer seem convinced of the positive causal relation of the two conditions. This has again been brought out by Moynihan. He fully agrees with the views of W. J. Mayo, whose enormous experience alone should be sufficient to establish the causal relation between ulcer and cancer beyond a doubt. . . .

"My observations seem to warrant the following conclusions:

"1. In all of the recent early cancers we have encountered, the growth was located in the edge of an ulcer.

"2. By careful study of the history of late cancer, in which the original ulcer had, of course, been obliterated by the growth, it was possible to elicit a previous ulcer history."

I have given a good deal of space to gastric ulcers, because they are a very important factor, the full significance of which will be made clear in Chapter IX, in which it will be shown how these ulcers are frequently caused.

Doctors are aware that cancer in the liver comes, as a rule, from the big bowel. Sir John Bland-Sutton, the celebrated surgeon, wrote in an article, "The Micro-Flora of Cancer," on page 279 of the *Medical Press and Circular* for 1922:—

"The study of the micro-flora of cancer helps us to understand the massiveness of some forms of secondary cancer. An ulcerating cancer in the rectum may not exceed the dimensions of a fig, but it is sometimes responsible for a ball of cancer in the liver as big as a cocoanut. The primary focus in the rectum swarms with colon bacilli. The secondary mass in the liver is sterile. The explanation is simple. The cancerous crater in the gut is due to the destruction effected by bacilli, and as it grows the new tissue is invaded and destroyed. The mass in the liver is due to minute sterile cancerous emboli detached from the growing edge of the cancer, conveyed by the portal circulation and arrested in the liver, where they grow luxuriantly, free from the influence of destructive micro-organisms. . . ."

The evidence supplied by leading surgeons and by

the leading textbooks is unanimous and absolutely overwhelming. It shows that indeed chronic poisoning resulting from chronic constipation, and favoured by the lesions arising in the big bowel to which it gives rise, is a most fruitful cause of cancer, not only in the bowel but also in the stomach, the liver, the female breast and uterus, and elsewhere. The lesions of the bowel which invite the entry of disease germs into the system are, however, in my opinion, created not only by the convulsive attempts of hard fæcal matter to pass through the kink, or kinks, previously described, which constrict and obstruct the bowel, but they are also very largely brought about by vitamine starvation, the effect of which will be authoritatively described in a special chapter, the 9th of this book.

The overwhelming amount of testimony brought together shows conclusively that cancer is not only induced by chronic poisoning from without by chemical poisons and burns, as was proved by means of a number of examples in the previous chapter, but that that terrible disease is also brought about by chronic poisoning from the bowels, by auto-intoxication consequent upon chronic constipation, especially in cases where the bowel tissues have been weakened by an injudiciously chosen diet and by acutely irritant purgatives which, unfortunately, are universally employed.

In the pages of this chapter Sir Arbuthnot Lane, Dr. A. C. Jordan, and a large number of other well-known authorities, have informed us that constipa-

tion is apt to lead to cancerous developments in many parts of the body, especially in the big bowel. The unanimity of the numerous and very expert witnesses should convince most that the views expressed by them are correct. However, a reader might say: "I am not convinced. Sir Arbuthnot Lane and the other authorities quoted are specialists who may look upon the matter from a narrow specialist's point of view. I want further evidence in confirmation of their assertions."

Sir Arbuthnot Lane and the other eminent men whose views have been given have based their opinion on a very wide practical experience. Now, of course, it might be conceivable that each of the authorities quoted had been prejudiced by a theory or by a fashionable doctrine. In medicine and in surgery there are fashions, just as there are in ladies' dress. If we wish to find out whether the views deliberately expressed by the most expert witnesses are reliable or not, we should look for confirmation, or for contradiction, to the official statistics relating to cancer deaths, statistics of which all the observers mentioned have strangely failed to avail themselves.

At the beginning of this chapter, a table relating to cancer deaths during the 10 years 1911-20 in England and Wales was given. It was extracted from the *Statistical Review of the Registrar-General,* 1923, and was reprinted in full. In that table a special section is devoted to deaths occurring through cancer of the abdomen. Those relating to the bowels were as follows:—

	Male Deaths	Female Deaths
Cæcum	1,191	1,990
Hepatic Flexure	123	167
Splenic Flexure	277	299
Sigmoid Flexure	2,488	2,940
Colon (part unstated)	6,847	9,287
Intestine (part unstated)	7,053	10,387
Rectum and Anus	18,297	14,007

Statistics, even if most carefully compiled, are not absolutely, but only approximately, correct. The figures given confirm the views expressed by Sir Arbuthnot Lane and the other witnesses quoted in the most remarkable manner.

The cancer sites are stated in the above table in the sequence in which the contents of the bowel move towards the exit. In the small intestine the contents are liquid, and their movement will scarcely cause lesions followed by ulcerative and toxic developments. Cancer in the small intestine is exceedingly rare. When the fæces arrive in the big bowel, they begin to dry up, partly through the normal absorption of the liquid, partly owing to the unduly long retention of stools on the part of the constipated. It follows that the bowel contents become harder and harder, the nearer they approach the exit. At the first difficult point which has to be negotiated, the hepatic flexure, the stools are still soft. Hence the cancer deaths attributed to cancer of the hepatic flexure number only 390 in the case of men and women. At the next turning-point, the

splenic flexure, where the difficulty of passage is somewhat greater, the cancer deaths number 576 in the case of men and women. At the last flexure, the sigmoid flexure, where is situated "the first and last kink," as Sir Arbuthnot Lane calls it, and where very hard stools force their way through in the manner described by Sir Arbuthnot, cancer is very frequent, and the deaths through cancer in that site number no less than 5,428 for men and women combined.

The stools are, of course, hardest close to the exit, about the rectum, and deaths from cancer of the rectum and anus—those of the anus are comparatively rare—come to the enormous number of 32,304 for people of both sexes. The statistics triumphantly vindicate Sir Arbuthnot Lane and those who share his opinion, and it is regrettable that those who, for years, have pointed out the danger of intestinal stasis, have not made use of these most remarkable figures.

Very likely deaths from cancer of the bowel show a similar progression in other countries. I would have liked to have obtained detailed figures from the United States and other countries. However, I was loath to delay the publication of the book, but I feel sure that the most remarkable British figures will be confirmed by the foreign statistics available.

I think the facts and figures supplied in this chapter prove that cancer in the bowel and elsewhere is caused in innumerable cases through chronic poisoning from the bowel, through auto-intoxication which has gone on more or less continu-

ously for 10, 20, or more years. Naturally readers will ask how the chronic constipation from which the civilized nations suffer has been brought about. That question will be answered in the chapters which deal with vitamine starvation, with the errors in food and feeding, and with modern habits which favour the development of cancer.

Disease is fought by the body by means which have been described by the biologists, as far as those means are at present understood. I do not wish to go into the scientific details in scientific language, but would only say that bodily resistance to disease depends, of course, upon bodily condition. Tissues of lowered vitality fall more readily a prey to cancer than healthy tissue. Chronic constipation not only leads directly to cancer, but also indirectly by weakening the body at many points. The way in which the organs and tissues of the body are affected by chronic constipation will be described in the next chapter.

CHAPTER VIII

How Chronic Constipation Undermines the Constitution, Weakens the Body, and Opens the Way to Countless Diseases

Modern biological science has taught us that most diseases are not "caught," as is widely believed, but that they develop during a struggle between the disease-producing elements and the wonderful defensive forces of the body which endeavour to protect it against assault and damage. There is a constant warfare going on in the human body between the various producers of disease and the natural defenders of our health and strength. Whether we fall ill or remain well depends largely upon the soundness and the cleanness of our bodies. On page 170 of his excellent popular book, *Health and Disease: Their Determining Factors,* Boston, 1917, Dr. Roger I. Lee, Professor of Hygiene in Harvard University, told us with regard to attacks by noxious bacteria:—

"The outcome of disease may be considered to depend upon three factors: the number of bacteria in the initial dose; the virulence of the bacteria; and the resistance of the body. . . . The most important fact in the intensity and the outcome of a disease is usually the resistance of the individual—the natural immunity or the natural sus-

ceptibility and the antagonistic reaction of the individual's tissues against the disease. . . . We know little positively concerning the mechanism of resistance and the defence of the body."

Sir Arbuthnot Lane gave in 1919 a most interesting address, entitled "Reflections on the Evolution of Disease," in which he comprehensively described all the evil consequences which flow from intestinal stasis, from chronic constipation. According to his opinion, that trouble undermines general resistance and attacks every portion of our bodies. By his kind permission, I would here give practically the whole of his address, which was reprinted in the *Lancet* of the 20th December, 1919:—

"Progress in medicine can only be made by acquiring the knowledge of the causation of disease. . . .

"Mechanical Effects of Stagnation at Points of Obstruction.

"The following are the mechanical effects which are exerted by the accumulated stagnating contents of the bowel at the points of obstruction produced by muscular spasm or by the development of controlling membranes.

"1. The impact of hard fæcal matter on the mucous membrane covering the sphincter muscle which controls the end of the pelvic colon is liable to produce ulceration or cancer in this situation.

"2. Excessive elongation of the pelvic colon may result in a torsion of the loop and the formation of a chronic volvulus. This arrangement permits of the entrance of material into the loop, but opposes its passage from it. The twist may at any time become so complete as to produce acute obstruction.

"3. The obstruction to the passage of hard fæces, which

is brought about by the last kink, may determine the development of cancer in this direction. Or the habitual overdistension of the bowel infiltrated with fat proximal to the obstruction may result in the development of diverticula, which may later become infected by inflammatory organisms or by cancer.

"4. Similarly, the obstruction at the splenic flexure may result in the formation of infective or cancerous ulcers.

"5. The obstruction afforded by the acquired ligament which develops between the under surface of the liver, the gall bladder, the pylorus, duodenum, and transverse colon, may produce ulceration at the seat of obstruction. As one would expect, this is not an uncommon seat of cancer.

"6. The same may occur from the control exerted by an acquired band on the ascending colon.

"7. The obstruction at the duodeno-jejunal junction may produce an elongation and dilation of the duodenum, most marked in its first portion, with congestion, abrasion, ulceration, and, later, perforation of the mucous membrane lining this part of the bowel.

"8. Spasm of the pylorus, which is associated with the duodenal distension, forms an obstacle to the passage of material through the pylorus, which may produce changes in the mucous membrane about it, varying in degree between congestion and cancer.

"9. In consequence of the obstruction to the gastric effluent by the spasmodic action of the pylorus, material accumulates in the stomach and exerts on the mucous membrane of the lesser curvature a tearing strain, which produces changes in it varying between congestion and carcinoma. It would appear that as long as the secretion of the stomach continues to be normally acid, the organisms or other materials which produce cancer are unable to obtain a secure foothold. This, however, may take place when the acidity becomes distinctly subnormal in amount.

"10. Any interference with the gastric effluent may cause an irregular, spasmodic contraction of the œsophageal

sphincter, commonly called cardiospasm. This obstruction to the free passage of material through the œsophagus is liable to produce changes in the mucous membrane which may later become cancerous. . . .

"The Infection of the Chyme by Organisms.

"The excessive stagnation of material in the large intestine appears to exert only a mechanical effect. At a later period, virulent infective organisms may thrive in the contents of the large bowel, and inflammatory changes of varying severity may ensue. These infections usually occur at an advanced stage of intestinal stasis, and are secondary processes similar to secondary infections in other parts of the body.

"The bacterial infection of the chyme which takes place in stasis alters the relationship of every tissue in the body to its food-supply as well as to the elimination of the products of tissue change. In static cases Dr. Mutch has demonstrated from specimens obtained from the contents at different levels of the small intestine during operations for colectomy, etc., that streptococci and B. coli, as well as other organisms, abound in the chyme, varying in degree and level with the extent of the stasis. He shows very clearly that while local delay is the primary factor in favouring the growth of organisms in the intestine, deficient assimilation of food, and especially of carbohydrates, in the upper part of the gastro-intestinal tract, is the second essential factor.

"Changes in the Liver and Pancreas.

"In stasis the liver cells are exposed to attack from three distinct sources. They have to deal with material, either toxins or organisms, carried to them through the radicals of the portal vein, having been absorbed from a tract which has ceased to be sterile and whose contents may contain a large number of very virulent organisms. They are also

surrounded by a fine network of ducts whose contents are liable to become infected by the extension of organisms along the common bile-duct. Again, the liver cells are nourished through the portal artery by blood laden with toxic material which the liver cells have failed to eliminate or convert.

"In the earliest stages of stasis the liver appears to be abnormally large, while later it is distinctly smaller than it should be.

"Just as every change, which the skeleton of the labourer undergoes in order to accommodate itself to its surroundings, tends to shorten the life of the individual, so do all the changes in association with, and dependent on, those in the gastro-intestinal tract tend to shorten life. Such changes in the organs are classified as diseases. It is obvious that the liver must develop many and various conditions, in consequence of its changed relationship to the food-supply of the body. The extension of organisms to the gall bladder may result in the formation of gall stones and in the development of the several complications which they produce, or it may cause inflammation of the gall bladder of varying degrees of intensity.

"The pancreas undergoes very definite changes in advanced cases of stasis. It becomes hard and nobbly in parts or throughout. These changes are probably chiefly inflammatory in origin and due to extension of infection from the duodenum along the pancreatic duct. Later, carcinoma may develop in the damaged structure of this organ. The same infective process may set up an acute inflammation of the pancreas. The invading organisms may also serve as a nidus for the formation of calculi, which may bring about serious complications by their presence. Dr. Mutch and Dr. Jordan have both demonstrated that advanced conditions of chronic intestinal stasis are often present in diabetes mellitus. The liver and pancreas have, besides sharing in the general depreciation due to being supplied with impure blood, the disadvantage of

being directly in communication through their ducts with the infected small intestine.

"Changes in the Kidneys.

"The eliminating organ on which, after the liver, most stress appears to be thrown is the kidney. Upon it devolves the strain of getting rid of abnormal toxins and organisms, together with an excessive amount of by-products. The changes which the kidneys may undergo are most variable, some being slow and almost imperceptible in their progress, while others are very acute. They include the types of Bright's disease, which probably vary with the nature of the organisms affecting the chyme. The kidney eliminates organisms into the urinary tract, through which they may be discharged painlessly and without affording any evidence of their presence. This is frequently the case with B. coli.

"In other cases the elimination of these organisms through the kidney sets up symptoms of great severity, rigor following upon rigor, with rapid loss of flesh and extreme prostration. In very acute cases the surface of the kidney may be studded with small abscesses. On one occasion I exposed such a kidney, opened up a large number of abscesses, packed the kidney in gauze, and stopped an infective process which threatened the life of the patient. As with all other organs and tissues, the improvement that takes place in the kidneys after such treatment, as is sufficient to sterilize the contents of the small intestine, is rapid and remarkable.

"Changes in the Organs of Generation and the Ductless Glands.

"In advanced stasis the ovaries are always wasted and shrunken, unless they are involved in acquired adhesions, when they become progressively cystic. The uterus is also very small, and in the late stages of stasis may be infantile in character, although the woman may have borne children.

"Perhaps one of the most remarkable evidences of auto-intoxication in the toxic woman is the complete loss of sexual desire, it being in many cases replaced by a feeling of disgust for the normal relation of the sexes. The same applies to the male, but to a less degree. The testes become small and soft, and the normal testicular sensation is much impaired. The complications which arise from these marked degenerative changes are chiefly responsible for the existence of the Divorce Court.

"The thyroid is the organ which is most closely associated with the sexual function, especially in the female, in whom its variations in size afford clear confirmation of the preponderating influence of sex in the woman as compared to man. In stasis the thyroid becomes enlarged at the onset but soon wastes, and later may shrink so much that its presence cannot be detected by the finger.

"It would seem reasonable to argue, by analogy from the effect of stasis on the thyroid, that the pituitary and adrenal glands behave in a similar manner in their attempt to meet the damage to structure and the drain upon their function that must result upon the supply to their tissues of blood heavily contaminated with toxic products. In the case of the adrenal, this is suggested by the remarkable pigmentation of the skin, which develops in stasis, especially in those of the brunette type. In advanced stasis the symptoms are definitely those of Addison's disease, but their disappearance after colectomy proves that the damage done to the suprarenals has not been irreparable. Unfortunately, our knowledge of the functions of the adrenal and the pituitary body are too incomplete to allow of much dogmatism on the changes which result in their structure and functions as the result of stasis.

"Changes in the Breast and in the Mouth.

"The breast undergoes very typical changes in stasis. It becomes hard and nobbly, and after a time a large number of cysts develop in its substance, some of which

may assume a considerable size. This change commences usually in the upper and outer zone of the left breast, then it appears in the corresponding portion of the right breast, and later may involve the entire substance of both breasts. These degenerated breasts are very liable to be affected by cancer.

"The tongue is almost always unhealthy in appearance. It is often abnormally large and marked by the teeth, which may decay early in life. The fauces and pharynx appear unhealthy. The sense of small and of taste are often impaired; the breath is not infrequently offensive, and the patient experiences a bad taste in the mouth.

"Changes in the Nervous System and in the Eyes.

"The effect of auto-intoxication upon the brain and nervous system is very striking, and calls for much sympathy. Headache, varying in intensity, is a common symptom. I have known it so severe, and accompanied with such violent attacks of vomiting, as to lead a very distinguished neurologist to diagnose a cerebral tumour and to urge operative interference. Neuralgias are frequent and may involve a great variety of nerves. They may be very intense. Rheumatic pains are constantly complained of. The patient, while sleeping badly, may find it difficult to keep awake during the day. Bad dreams are frequent.

"On awakening in the morning, the feeling experienced may be that of extreme prostration, no apparent benefit having been derived from the night's rest. The most distressing symptom of intestinal auto-intoxication is the depression which so frequently accompanies it. It varies in severity from a feeling of mental incapacity to one which not infrequently leads the sufferer to attempt to terminate an existence which has become intolerable. All efforts at mental concentration are futile, while any physical exertion is followed by a period of complete exhaustion.

These patients become introspective, and women especially are liable to become intensely religious.

"The term 'neurasthenia' is very often applied to this condition of the nervous system. In some degree it is an almost invariable symptom of stasis. The patient loses control, and fits of irritability or of violent passions are not infrequent. Such a person is difficult to live with. Many are supposed to be stupid, dull, inattentive, or even imbecile. This feature is more marked in the growing child, who is often at the bottom of the class, and may be severely criticized or punished in consequence.

"The eyes are always affected. They afford an excellent and very delicate indication of the degree of auto-intoxication, and the changes they undergo are of great value to the observer. They are due chiefly to degenerative processes in the lens and to loss of power in the ciliary muscle. Mr. Ernest Clarke has described these conditions with his characteristic clearness.

"Changes in the Skin.

"The skin varies in character in different parts of the body. The most marked feature is a staining or pigmentation over the abdomen, chest, and neck. This is particularly noticeable in the neck, axilla, and groin, and over any area which has been exposed to pressure. The staining is usually uniform, but it may be blotchy in character. Like all the other manifestations of auto-intoxication, this symptom varies with the colour of the hair. While it is very marked in dark-haired people, it is very slight or absent in those whose hair is red or towy coloured. The skin of the abdomen is thin. When dragged on at any point, it presents innumerable fine ridges or wrinkles. The skin of the back of the trunk feels thick. Over the extensor surface of the upper arm this thickening is very conspicuous, and suggests to one's fingers that the subcutaneous tissues are permeated with a gelatinous material. The colour of the skin in this area is often blotchy and

livid, even in quite mild weather. It is frequently covered with papules, and may be so disfiguring as to render it impossible to expose the arms in evening dress.

"The hair becomes grey, thin, and tends to fall out. At the same time a fine down grows on the cheeks, the chin, and upper lip. The margin of the hair-line on the forehead and eyebrows is ill-defined, and hair covers the adjacent skin beyond the normal limit. Hair also grows on the back of the forearms. The perspiration is often profuse and offensive. The temperature of the body is invariably subnormal, any rise indicating the presence of some superadded infection. The ears are cold and livid. The temperature of the surface of the body changes abruptly at the level of the deltoid, the skin becoming progressively colder as the fingers are approached. In consequence of this defective circulation, the forearm and hand become livid with any depression in the temperature. This may be so marked a feature as to make it difficult to draw any sharp line between stasis and Raynaud's disease.

"In some cases the skin may be quite blue, and this colour may vary. To it the term 'microbic cyanosis' has been applied. The same low temperature is observed in the legs, the patient occasionally complaining of loss of sensation up to the level of the knees.

"Loss of Fat and Wasting of Muscle.

"The disappearance of fat plays, perhaps, a most disastrous part in the sequence of chronic intestinal stasis. Though it is usually an early and progressive feature, it is not universal, as some patients may have acquired a condition of considerable obesity before stasis becomes a marked feature. The loss of fat gives to the patient an appearance of senility. The graceful curves of the breasts, abdomen, and buttocks are replaced by pendulous wasted breasts, by a flaccid abdomen, and by wasted soft buttocks. The removal of fat results in the prolapse of the viscera,

and especially of those that are largely dependent on it for support.

"The kidneys drop, and their functions are impaired in consequence. The outflow of urine is obstructed by the angulation of the ureter at its junction with the pelvis or over a vessel, and hydronephrotic conditions result. The venous flow from the kidneys is similarly obstructed, and in consequence the organ becomes gorged with blood and very sensitive. As it lies upon the hard floor formed by the iliac fossa, its sensitiveness is increased by every movement, and the pain and distress which ensue are considerable. The puddling of urine in the pelvis increases the risk of infection by Bacillus coli or other organism expelled by the kidneys. The loss of fat also permits of the further dropping of the intestines, and increases the angulation and obstruction at difficult points. The uterus and bladder miss the support afford by fat, and their consequent prolapse produces many inconvenient symptoms.

"The wasting of the muscles which occurs early in stasis is responsible for a great variety of symptoms. It affects both the voluntary and the involuntary muscles. Perhaps the earliest evidence of loss of power in the voluntary muscles is afforded by the loss of thoracic respiration, the patient depending for the oxygenation of the blood upon the more reflex and less exacting action of the diaphragm and abdominal muscles. The attitude which is assumed in consequence is very disfiguring. It is interesting to note that this condition of abdominal respiration precedes, and is responsible for, the development of all those deformities which I regard as due to the fixation, and later the exaggeration, of 'resting postures,' which are all thus indirectly due to the auto-intoxication of chronic intestinal stasis. They are 'dorsal excurvation,' 'flat-foot,' 'lateral curvature,' and 'knock-knee.'

"As regards the involuntary muscles, the passage of material through the bowel is influenced by wasting of the muscle and nerve fibre of the intestine, and a veritable

vicious circle is thereby developed. The flaccidity of the muscle fibre of the uterus is responsible for the several versions and flexions which this organ develops, and they are exaggerated by the absence of the fat which plays such an important part in supporting this organ in position. Mr. Chapple has demonstrated the very close dependence of uterine disease on intestinal stasis. The changes in the heart substance and in the walls of the vessels produced by intestinal stasis have been rendered perfectly familiar to us by Mackenzie's elaborate researches, and we now realize the degenerative changes that are produced in the cardio-vascular system by stasis. . . .

"In view of the much greater frequency of stasis in the female than in the male, it is not surprising to learn that cancer occurs twice as often in women as in men. The rarity of cancer amongst native races living in the savage state, and its frequency in those who have been civilized for some time, help to support the view that stasis plays the chief part in the causation of this disease."

As Sir Arbuthnot Lane has carried on a campaign against intestinal stasis for a great many years, making that subject peculiarly his own, one might imagine that he was carried away by his idea and that he was unconsciously exaggerating the importance of chronic constipation, attributing to it almost every ill flesh is heir to. Indeed, there are many who consider the consulting surgeon at Guy's Hospital to be an enthusiast or an alarmist. However, a great many of the ablest and the most progressive physicians and surgeons are in entire agreement with his views, and an ever-widening circle of experts support him. It would be tedious, and it is scarcely necessary, to quote in support a number of distinguished scientists and practical men. I would

therefore give only a single opinion, that of Dr. Leonard Williams, Physician to the French Hospital in London, which will be found on page 111 of the 4th Edition of his excellent book, *Minor Maladies and their Treatment,* London, 1918. The distinguished author states:—

"It is but a slight exaggeration to declare that every chronic disease is a symptom of chronic constipation. It is no exaggeration whatever to say that chronic constipation is at least a contributory cause in all chronic diseases. At the back of the microbe there is to be sought the cause of the microbe, and this cause in every case is the state of the soil which permits him to flourish. Such a state of soil is described as a chronic auto-intoxication, which is only another way of saying that the drainage system is defective. And when the drainage system is defective to the point of there being a cesspool under the floor of the gastric dining-room, the powers of resistance are so reduced that the microbe comes and takes possession with easy and stupefying assurance.

"There are many diseases about which long articles and even large volumes have been written—pyorrhœa alveolaris and rheumatoid arthritis, for example—and many dyscrasias—the gouty, the glandular, the acid, and the migrainous, to wit—which are no more than symptoms of chronic intestinal stasis. The percolations from the cesspool have permeated the soil, and the whole carcase becomes inhabited by the fauna and flora of decomposition and disease. The particular members of these hostile groups which are destined to lead the invasion, and the particular points selected for their ultimate development, are decided by considerations which are at present beyond us.

"This general result, the toxæmic, of chronic constipation, is not sufficiently insisted upon. The symptoms usually cited are correct enough in their way, but they are too local and too topical, and therefore too singular.

The earthy complexion, the cold extremities, the subfæcal odour of the axillæ, the emaciation, the general malaise, Lane's cystic breast, and the like, are very real manifestations of the poisoning, but it is to be remembered that the same poisoning forms the foundation upon which actual diseases are built. Such are rheumatoid and other forms of arthritis; exophthalmic and other forms of goitre; 'borderland' and other functional nervous manifestations; menstrual disturbances and various gynæcological conditions; and others too numerous to mention. The existence of a chronic disease should thus create a suspicion in our minds that its existence and continuance are rendered possible by insufficient intestinal drainage. The individual symptoms just referred to will always help in this direction; but even in connection with these it must be remembered that they must be looked for; none are so salient but that they easily escape the superficial observer.

"From the foregoing it follows that in treating chronic constipation we are treating not only a toxic blood state, but we are also treating many so-called diseases, and that many so-called diseases cannot be satisfactorily treated unless and until the constipation and the consequent blood state have been successfully dealt with."

Many similar opinions might be quoted. That given above summarizes, and is representative of, a good many. If, as Sir Arbuthnot Lane maintains, chronic constipation undermines the strength and the power of resistance of the body in every part, it is perfectly obvious that that widespread trouble opens the door to a great many diseases, among them cancer.

CHAPTER IX

Cancer is Due to Chronic Poisoning and to Vitamine Starvation—Proof that Vitamine Starvation is an Important Factor

In Chapter VI of this book I stated that cancer was in my opinion caused by chronic poisoning and by vitamine starvation.

In the preceding three chapters I think I have proved by an overwhelming mass of evidence that the disease is indeed brought about by poisons entering our bodies from without, by chemical poisons, or by poisons distilled within our bodies, by bowel poisons, which have been absorbed during a very great number of years. In the sixth chapter a large number of examples have been given showing that chronic poisoning has led to an outbreak of cancer often only after 20 years or more of exposure to various poisons.

My contention that vitamine starvation is a very important factor in bringing about cancer is, I think, new to most, and requires proof. I shall show by evidence which cannot be disregarded that vitamine starvation not only weakens the body and its powers of resistance in a general way, that it not only leads to chronic constipation, the importance of which as a cancer-producing factor has been pointed out by Sir Arbuthnot Lane and many other

highly qualified men quoted in the foregoing, but that, in addition, it causes the weakening, the degeneration and the laceration of the stomach and bowels as well. These lesions cause the appearance of ulcers in the stomach and elsewhere.

In Chapter VII a vast amount of expert testimony has been produced showing that cancer of the stomach frequently arises out of stomachic ulcers. It has also been shown in a table in the beginning of Chapter VII that cancer of the stomach and cancer of the bowels claim an enormous number of victims in England. In other countries the proportion of men and women who die from cancer of the alimentary canal is most likely approximately as great as it is in Great Britain.

It stands to reason, and need scarcely be proved, that vitamine starvation, an evil which unfortunately, but unnecessarily, accompanies our civilization, lessens the power of the body to resist the assault of disease. Hence the combination of chronic poisoning by bowel poisons and chemical poisons and of vitamine starvation is apt to prove most disastrous. Matters would, perhaps, be different if chronic poisoning was not accompanied by vitamine starvation or if vitamine starvation was not accompanied by chronic poisoning.

The importance of those mysterious factors which are called vitamines and which nobody has yet been able to isolate is becoming widely recognized. However, before describing how modern civilized men are being starved of vitamines and how vitamine starvation affects us humans according to valuable

and convincing experiments made, I would briefly show how and why we have been deprived to an ever-increasing extent of vitamines during the last few decades, during a time when the cancer mortality has made the most startling progress, and I shall indicate some of the known consequences of vitamine starvation before considering its influence upon the genesis of cancer.

The food chemists are probably responsible for vastly more deaths and suffering than are the chemists who have given us high explosives and poison gas. For decades chemists have analysed our foods and, with the vanity of little knowledge and less imagination, have laid down with great assurance certain "laws" of nutrition which have proved disastrously wrong, but which, unfortunately, were generally accepted and acted upon.

The food chemists taught the medical profession and the people in general that the value of foodstuffs consisted solely in the proteins, fats and carbohydrates contained in them. Food manufacturers and the general public became interested chiefly in and infatuated by the theoretical nutritive values of foods as established by the chemists. They little knew that there were in existence absolutely indispensable food elements, the presence of which was revealed to us only when the nutrition of the whole civilized world had been placed upon an artificial, absolutely faulty and most dangerous basis. Dr. Victor C. Vaughan stated on page 20, vol. 2, of the great work *Epidemiology and Public Health,* published by H. Kimpton in 1923:—

"It seemed that the chemist had solved all the problems concerning the nature and composition of our foods. He had determined the amount of water in every organ and tissue in man's body; had estimated the amount of moisture in our food; and calculated the quantity of fluid that the average man should consume each day; had determined the amount of water leaving the body daily through the bowels, skin and lungs. He had made both qualitative and quantitative determinations of the inorganic constituents of bone, muscle and brain; and estimated the amount of each of these substances in our foods and had shown how they are absorbed and assimilated. . . .

"He had constructed long tables showing the percentages of water, inorganic salts, carbohydrates, fats and proteins in food. He had calculated the amount of each food principle essential to the daily diet in order to supply the machine with sufficient energy to enable it to accomplish its work and with sufficient constructive material to repair any wear and waste in the machine itself. He had determined that our daily diet should consist of so much water, so much kinds of inorganic salts, so much carbohydrates, fat and protein. He believed one carbohydrate to be as good as another, provided the two were equal in energy content; that one fat could supplant another in our food, provided that in the exchange quantity should be considered; that proteins consist of amino acids and each of these must be present in at least the minimum amount necessary to build up the proteins of the human body. He emphasized the necessity of being in a state of nitrogen equilibrium, with the amount of each element equal in the ingesta and the egesta. . . ."

Long before the existence of vitamines was suspected I absolutely disbelieved that salads, cucumbers, etc., had "no food value," not only because I observed that these things were keenly sought after by the poorer people who could ill afford to buy

them, but also because they excited the utmost pleasure in monkeys and other animals. I concluded that sound instinct told men and beasts that these "scientifically valueless" foods were in reality exceedingly valuable for some reason or other hidden from the scientists.

Until recently we were gravely told to measure the value of the foods we eat according to their protein, carbohydrate and fat contents, by calories, etc., and the wretched text-books still give these worthless and utterly misleading classifications. Yet men and animals die when supplied only with the pure food elements known to the chemist. The fact was discovered only recently. In 1919 the British Medical Research Committee published a most valuable *Report on the Present State of Knowledge concerning Accessory Food Factors (Vitamines)* which stated:—

"For many years past it has been customary to estimate the nutritive requirements of the animal organism in terms of what have been for long regarded as the four fundamental food units, namely, protein, carbohydrate, fat and inorganic material, and to under-estimate, if not entirely neglect, the possible significance of other less clearly defined dietary constituents. . . .

"A number of investigators since Lunin's time have attempted to supply the nutritive requirements of animals, usually rats and mice, by means of artificial diets composed of mixtures of proteins, fats, carbohydrates and inorganic salts, but it was found exceedingly difficult even to keep the animals alive for any appreciable time upon such diets. In practically every case, no matter how carefully the composition of the diets had been planned so as to provide what was considered an adequate and well-

balanced supply of the necessary food units, the animals showed a steady decline in weight and health throughout the course of the experiments, and seldom survived for any appreciable length of time. . . .

"We must now turn our attention to the classical experiments carried out by Hopkins in this country. As early as 1906 he wrote as follows:

" 'No animal can live upon a mixture of pure protein, fat and carbohydrate, and, even when the necessary inorganic material is carefully supplied, the animal still cannot flourish. The animal body is adjusted to live either upon plant tissues or other animals, and these contain countless substances other than the proteins, carbohydrates and fats. Physiological evolution, I believe, has made some of these wellnigh as essential as are the basal constituents of diet.' "

If "no animal can live upon a mixture of pure protein, fat and carbohydrate" we may safely conclude that no human being can live on them either. Yet we have been urged for decades, and are still being urged, to adopt a "scientific" diet. Unfortunately a "scientific" diet is not only absolutely unscientific, but it is deadly.

The scientists believe at present that there are three, four or five vitamines, but none of these has been isolated, and, for all we know, there may be three hundred, four hundred, or five hundred vitamines. We may never succeed in isolating them and we may not even succeed in more than suspecting the existence of an unspecified number. The suspected and the, as yet, unsuspected vitamines are found in food in its natural condition, and they are almost universally destroyed by the processes which food undergoes with a view to "improving"

it, which means making it more palatable, more easily chewed, more easily stored and prepared, and more attractive to the eye.

The "improvement" of many grain foods, such as the polishing of rice and the overmilling of wheat, leads to beri-beri. Formerly beri-beri was believed to be a tropical disease because it occurred only in the rice-eating countries, but of recent years it has made its appearance among the wheat-eating nations as well. The Report of the British Medical Research Committee previously mentioned states on pages 25 and 53:—

"Beri-beri is a disease characterized by severe nervous disorder occurring principally among rice-eating populations. . . . In severe cases the heart is usually involved, and death may occur suddenly from heart failure. The mortality is high. . . .

"This disease has, in the past, been regarded as a tropical disease confined to rice-eating populations. It is now recognized that this, though the best known example of endemic beri-beri, is only a special case of what will inevitably occur when the diet consists too exclusively of a cereal which has been impoverished by excessive milling. The researches of Eijkman, Grijns, and later of Braddon, Fraser and Stanton, have shown that the disease does not occur among the East Indian and Malay rice-eaters when unmilled or home milled rice is taken and that it can be cured or prevented by restoring to 'polished' rice the valuable constituents (germ or embryo and silverskin or pericarp) known as 'rice polishings' removed in the milling. . . .

"In Newfoundland and Labrador the population subsists largely on bread during the winter and spring. Formerly, when the bread was baked from 'brown' flour, beri-beri was unknown, as can be testified by the memory

of the older inhabitants. At the present time, with the advance of civilization, the bread is made from pure white wheaten flour and beri-beri is frequent. Little relates the following interesting occurrence. In 1910 a ship ran ashore, laden with a cargo of whole-meal wheaten flour, and in order to lighten her a considerable portion of her load was removed and was subsequently consumed by the population in the adjacent districts. The result was that no case of beri-beri was reported in that region for a period of one year following this event.

"Beri-beri was a rare disease on Norwegian ships before the year 1894. In that year an alteration was made in the sailors' diet in response to a popular agitation to ameliorate the hard conditions of their life at sea. The sailors had previously lived on biscuit baked from rye flour (in the milling of which there is no separation of germ). After this date masters of ships were compelled to supply bread baked from white wheaten flour of a mixture of wheat and rye flour, and beri-beri became a frequent disease in the Norwegian mercantile marine.

"There is an amusing story of one old sea captain who disapproved of the new-fangled reforms and insisted upon a supply of rye flour being taken on board for his own personal consumption. He was rewarded for his independence with the satisfaction of effecting cures among his men, who, when stricken with beri-beri, were supplied with biscuit from the captain's private supplies. As, however, these gradually showed signs of depletion, he was finally compelled to husband them in order to preserve his own health.

"The deficiency in white wheaten bread is under ordinary conditions made good by the varied diet enjoyed by Europeans. If, however, the 'mixed diet' is derived from tinned and preserved foods the case is otherwise and beri-beri may be expected. This was no doubt the explanation of the beri-beri which has been reported among our troops in the Dardanelles and in Mesopotamia."

During the Kut campaign, the white soldiers who were fed with white bread suffered severely from beri-beri, while their Indian comrades, living on coarsely ground whole grain, had not a single case of that disease. Margaret Hume, of the Lister Institute, told us in the book *Life and its Maintenance: A Symposium on Biological Problems of the Day,* Blackie & Son, Ltd., 1919:—

"Beri-beri is most common amongst rice-eating peoples and among them is almost universally confined to those who eat the rice from which the skin or cortex, together with the embryo, germ or plantlet, have been removed. It is not, however, confined to rice-eating peoples; any diet consisting too largely of highly-milled cereals, whether wheat, maize, rice, or any other grain, will equally well produce it. . . .

"In the advance to Kut and during the siege the ration was white army bread and meat, partly fresh, partly tinned, with very little variation. The men began to go sick, with pains in their shins and general malaise, which in many cases became acute beri-beri.

"Among the Indian soldiers in the siege the course of events was altogether different. The ration for Indian soldiers is totally different from the British one. Two of the principal items which it contains are atta and dhal. Atta is very coarsely ground wheat flour, and dhal is any kind of pulse, pea, bean or lentil. Thus the Indian dietary contains two items very rich in anti-beri-beri vitamine. The Indians, in fact, never had any case of beri-beri, and what is more interesting, when, during the siege of Kut, the white wheat flour ration for the British troops ran out, atta was served out to them instead, and from that time beri-beri disappeared from among them, as is described by Colonel Hehir in the Mesopotamia report.

"A better instance than the foregoing could scarcely be

wished for to show that beri-beri develops on a diet consisting too largely of over-milled cereals and clears up when the whole grain is served out."

Formerly scurvy was practically exclusively a sailor's disease. It was caused through lack of fresh vegetables and of the vitamines which they contain. It occurred frequently during the long voyages of the sailing-ship era. It is becoming more and more prevalent in inland countries because the habit of overboiling vegetables and of shunning uncooked vegetables has arisen. From the British Report on Vitamines previously mentioned, I would give two examples which show how scurvy may break out by consuming overboiled vegetables and which will be found on page 65:—

"Scurvy broke out in a camp in Scotland in the spring of 1917 and 82 men were affected. At the time, potatoes were scarce, but the ration contained a fair proportion of fresh meat and 2 ounces of swedes were available daily. These are among the most potent anti-scorbutic vegetables we possess, and, if cooked satisfactorily, should have afforded considerable protection. The cause of the outbreak was investigated by Professor L. Hill, who discovered that the meat was always served as a stew, the vegetables were added, and the *whole cooked for about* 5 *hours.* This circumstance was considered by Professor Hill to be a sufficient explanation of the outbreak.

"A second example is afforded by an outbreak of scurvy which broke out in a Kaffir labour battalion in France between May and July, 1918, and in which 142 cases of pronounced scurvy were diagnosed. In this case there was a ration of fresh vegetables equal to 8 ounces daily. These were cooked with the meat and boiled for a period of at least

3 hours. In the opinion of the medical officer, by whom the circumstances of the outbreak were thoroughly investigated, this fact was an important contributory cause."

Vitamine starvation has brought to many countries beri-beri, scurvy and pellagra, three horrible diseases which formerly were little known. If fairly intensive vitamine starvation is apt to bring about these diseases in a relatively short time, as the examples given in this chapter prove, we may be absolutely certain that chronic, though not intensive, vitamine starvation is bound to have exceedingly serious consequences. That seems to me an unchallengeable proposition.

Chronically vitamine-starved people cannot possibly offer adequate resistance to attacks of disease and must be expected to fall victims to cancer far more easily than those native races which are not vitamine-starved. Herein lies one of the reasons why, as convincingly shown in the third chapter, cancer is a disease of civilization and is almost unknown among primitive races.

Unfortunately, vitamine starvation not only lowers the power of resistance in a general manner but it leads to a most serious degeneration of the entire digestive tract. One of the ablest investigators and experimenters is Colonel Robert McCarrison. His books investigating the causation of goitre and the consequences of vitamine starvation are classics. He stated in an address on "Faulty Food in Relation to Gastro-Intestinal Disorder," which will be found in the *Lancet* of the 4th February, 1922:—

"The health of the gastro-intestinal tract is dependent on an adequate provision of vitamines. The absence of growth vitamines is capable of producing pathological changes in the tract which frequently assume the clinical form of colitis. This observation is of the highest importance in view of the frequency with which this malady is met with at the present day.

"Deficiency of vitamine C is especially concerned in the production of congestive and hæmorrhagic lesions in the tract, and evidences of these may be found in animals which have not exhibited during life any of the clinical manifestations of scurvy in noteworthy degree. A state of illhealth of the gastro-intestinal tract may thus be a pre-scorbutic manifestation of disease due to insufficiency of this vitamine, especially when associated with an excess of starch or fat, or both, in the food.

"The disorder of the gastro-intestinal tract consequent on vitamine deficiency is enhanced when the food is ill-balanced.

"The pathological processes resulting in this situation from deficient and ill-balanced foods are:

"(*a*) Congestive, necrotic and inflammatory changes in the mucous membrane, involving sometimes the entire tract, sometimes limited areas of it.

"(*b*) Degenerative changes in the neuro-muscular mechanism of the tract, tending to dilatation of the stomach, ballooning of the areas of small and large bowel, and possibly to intussusception.

"(*c*) Degenerative changes in the secretory elements of the tract—of the gastric glands, the pyloric glands, the glands of Brunner, the glands of Lieberkuhn and the mucous glands of the colon. These changes are such as must cause grave derangement of digestive and assimilative processes.

"(*d*) Toxic absorption from the diseased bowel as evidenced by changes in the mesenteric glands.

"(*e*) Impairment of the protective resources of the

gastro-intestinal mucosa against infecting agents, due to hæmorrhagic infiltration, to atrophy of the lymphoid cells, and to imperfect production of gastro-intestinal juices. This impairment results not only in infections of the mucous membrane itself, but permits of the passage into the blood-stream of micro-organisms from the bowel.

"(*f*) It is to be emphasized that the pathological changes found in the gastro-intestinal tract are more marked in some individuals than in others; and that, while all of them may occur in one and the same subject, it is usual to find considerable variation in the incidence of particular lesions in different individuals."

If, as Colonel McCarrison states, vitamine starvation leads indeed to "congestive and hæmorrhagic lesions in the digestive tract, to degenerative changes in its neuro-muscular mechanism and its secretory machinery, to toxic absorption from the diseased bowel and the impairment of the protective resources of the tract against infectious agents," then it becomes perfectly obvious that vitamine starvation causes the breakdown of the entire abdominal machinery and leads to chronic constipation and to chronic auto-intoxication, to Sir Arbuthnot Lane's stasis and all its consequences, including cancer.

Colonel McCarrison is not a theorist or a dreamer, but he is a scientist of the highest type. The conclusions given in his address quoted are derived from exceedingly important experiments made on numerous animals, and especially on monkeys, whose physique and digestive apparatus most closely resembles those of human beings. These experiments were fully described by the author in his magnifi-

cent book *Studies in Deficiency Diseases,* which will presently be quoted. Before doing so I would give a summary of his experiments on monkeys which appeared in his address "Deficiency Disease" which was published in the *Medical Journal* on the 12th June, 1920. Describing the effect of vitamine starvation on monkeys, Colonel McCarrison stated:—

"The clinical effects, as seen in monkeys, are these: failure of appetite, loathing of food, loss of weight, progressive anæmia and asthenia, failing health of the skin, staring hair, loss of hair, eruption and eczematous patches, low temperature, slow respiration, headache, vomiting occasionally, diarrhœa, dysentery, impaired sensation, great muscular weakness, inco-ordination, and paresis.

"Death occurs in a hundred days in the monkeys. It is greatly hastened when deficiency of vitamines and excess of carbohydrates are associated with an excess of fats in the foods. In these circumstances the loss of weight is more rapid; the stools may have a sprue-like character, fatty acids are present in them in great excess; atrophy of the pancreas, of the thyroid, the heart, the lungs, the spleen, and the submaxillary glands is marked, while, on the other hand, the weight of the brain is one-seventh part greater than in healthy control monkeys. All these symptoms may not occur or may not be equally severe in every animal, but they are the common clinical manifestations of the dietetic error in monkeys and may be supposed to be the common clinical manifestations of the same dietetic errors in man.

"However remarkable the production of these disorders in monkeys may appear to be, it is even more remarkable to note the rapidity with which they disappear when the deficient and ill-balanced dietary is replaced by one more perfectly proportioned and containing an adequate supply of vitamines.

"Colitis can be produced by a deficient diet with great

regularity in monkeys, and can be cured by the provision of suitable food; so also can the anæmia and the dyspeptic disturbances. We know in a general way that in man digestive disturbances will cause anæmia, or that blood-destroying agents will do so; we know that dysenteric organisms may cause colitis; but apart from the little that we know of these matters, I ask, What is the cause of the colitis which is so common and is not due to gross lesions of the stomach, or what is the cause of anæmia not due to blood-destroying organisms? I submit that a common cause of all of them is food deficient in vitamines and ill-balanced with respect to proximate principles, and that, by giving suitable simple vitamine-containing foods, we can cure, or greatly relieve them.

"Diets thus defective lead not only to great muscular wasting, loss of fat and loss of weight, but to certain changes in the viscera.

". . . Digestive disturbances and dilatation of the stomach are so constantly present in monkeys fed on these deficient dietaries that they may be regarded as cardinal signs of such deficiency. . . . The provision of these substances in the food will restore this organ to normal activity in the human subject where the derangement is definitely due to the absence of vitamines. The following is a case in point which recently came under my care:

"A man, aged 60, had for 20 years been a confirmed invalid. He was a martyr to dyspepsia and had a greatly dilated stomach, which he washed out three or more times a week—to his great exhaustion. He had not had a natural motion of the bowels for many years, but used a glycerine enema daily. He was very anæmic and of a colour which one associates with cancer of the pylorus. On examination I found a dilated stomach, a tender duodenum, 'airlock' in the small intestine, and a tender cæcal region, but no evidences of cancer. For many years he had been subsisting on a diet excessively rich in carbohydrates, deficient in suitable proteins and in vitamines. He never ate fresh

fruit and but rarely vegetables, and then overcooked. He complained of neuritic pains in the lower limbs and felt that he was losing the use of them.

"As his diet was very similar to that of my monkeys, I resolved to treat him in the light of the results I had noted in these animals. He was put to bed, given a small quantity of raw milk every two hours and a solution of vitamines at night. Gradually the food was adjusted so as to contain an adequate supply of vitamines and of proximate principles in due proportion; it was made up mainly of eggs, cheese, fish, fresh fruit, wholemeal bread, and green vegetables. He was deprived of his stomach tube and glycerine enema syringe and given paraffin only. The vitaminic extract in solution was continued. He made rapid strides towards recovery; in 2½ months he gained 10 pounds in weight, was freed from all symptoms of dyspepsia, and the bowels, aided by paraffin, acted normally. . . .

"There is much that I have been compelled to omit in so brief a consideration of the subject as this; amenorrhœa, sterility, inability of women to suckle their children, the effects on breast-fed infants of human milk deficient in vitamines, dental caries, rickets, beri-beri, œdemas, and the special effects of vitaminic deficiency of the endocrine organs. All these and much more are deserving of the closest study in connection with the great question of diet as a factor in the causation of disease and racial degeneration. There is, indeed, no more important problem before the country at the present moment than the proper provision to the people of a properly constituted food, and no more urgent necessity than their instruction in these matters."

In his wonderful work *Studies in Deficiency Diseases,* Colonel Robert McCarrison describes in full detail all the consequences of vitamine starvation upon monkeys and other animals with which he has

experimented and summarizes the effects which vitamine starvation has upon the body. He states on pages 210 and 223 of his book:—

"Vitamines are as the spark which ignites the fuel mixture of a petrol-driven engine, liberating its energy; the spark is of no use without the fuel, nor the fuel without the spark; nay, more, the efficiency of the spark is dependent in great measure on the composition of the fuel mixture. . . .

"In the absence of vitamines or in their inadequate supply, neither proteins nor fats nor carbohydrates nor salts are properly utilized; some are largely wasted, while others yield products harmful to the organism. In these circumstances life may be sustained for a longer or a shorter period, during which the body utilizes its reserve stores of vitamines and sacrifices its less important tissues to this end. But there is a limit beyond which such stores cannot be drawn upon, and once this is reached, the cells of higher function, secretory endocrine, and nerve cells, begin to lack vigour and to depreciate in functional capacity, although the tissues may still hold considerable stores of vitamine. The disintegration process is delayed or hastened, lessened in severity in one direction or increased in severity in another, according to whether the food constituents are well or ill-balanced and according to the character of their lack of balance. . . .

"One of the earliest pathological evidences of deficient and ill-balanced foods, as observed in animals, is congestion of the gastro-intestinal mucosa. Such a state of congestion may well give rise, in children, to the gastro-intestinal catarrh which characterizes 'mucous disease.' This disorder is very common among children who are fed largely on sterilized milk, artificial foods, white bread, polished rice, poor butter, overcooked vegetables and excessive quantities of sugar. . . .

"It is hardly necessary to comment on the great fre-

quency at the present day of colitis of ill-defined origin. The state of chronic anæmia, the unhealthy skin, often evidenced by acne or seborrhœa, the loss of weight, the lassitude, the backache, the colicky pains in the abdomen, the bouts of diarrhœa alternating with constipation, the mucous stools, and the neurotic conditions of those afflicted by it, usually women, are familiar features of this untractable malady.

"One of the most constant results of food deficient in vitamines is colitis. It is so frequent that it may rank as a cardinal sign of vitaminic deficiency. It may arise as the result of the absence of vitamine B alone, although it was more frequently encountered in animals deprived of vitamines in general. Many of the other features of this malady, as seen in nervous, constipated women, were reproduced in deficiently fed monkeys, such as the anæmia and unhealthy skin and the loss of weight; even the congestion of the uterus and ovaries, which is so often present in woman sufferers from colitis, was reproduced in monkeys. Unfortunately most cases of this character in the human subject are of very long standing.

"I have myself no doubt that a proportion of them have resulted from the long-continued use of deficient foods from childhood onwards. I regard the experimental production of colitis as one of the most important results of these investigations. It indicates that, if the incidence of colitis is to be lessened in the future, attention must be directed to the dietetic habits of childhood. Otherwise a chronic colitis is likely to be established and to prove most intractable.

"The histo-pathological changes occurring in deficiently fed pigeons and monkeys indicate one means by which both the abdominal musculature and the neuro-muscular system of the gastro-intestinal tract can be simultaneously impaired in functional capacity. Deficiency of certain food factors leads to atrophy of all muscular tissues as well as to the disordered function or actual degeneration of nervous

tissue throughout the body. The abdominal musculature, and the nerve elements controlling it, must of necessity suffer along with other muscular and nervous tissues. It may be concluded, then, that defective action on the part of the abdominal musculature will ultimately result as a consequence of deficiency of vitamines.

"In addition to this functional defect on the part of the abdominal wall, we find in pigeons, guinea pigs and monkeys starved of vitamines unquestionable evidence in the wall of the intestine itself of neuro-muscular lesions of great significance.

"We are, I think, justified in applying these results to the genesis of stasis in the human subject, more especially as this condition has actually been found to result from bad food in prisoners of war. As a factor in the production of chronic intestinal stasis, we must regard with suspicion human food which does not conform to standard in respect of its balance and vitamine contents. There can be no doubt that the food of children among the poorer, and often among the richer, classes is frequently dangerously faulty in these regards. Subsistence on such foods from infancy onwards is calculated to lead to defect of the abdominal musculature, to neuro-muscular lesions of the intestines and to degenerative changes in the glandular elements of its mucous membrane. . . .

"Attention has been drawn to the occurrence of gastric ulcer in three out of ten monkeys fed on autoclaved food. Ulcers of the stomach and duodenum were also encountered in guinea pigs fed on crushed oats and autoclaved milk. Deficient and ill-balanced foods may thus be added to the list of chemical, mechanical, toxic, nervous and bacterial agencies capable of producing superficial hæmorrhagic erosions and acute ulcers of the stomach and duodenum.

"The changes resulting in the stomach and duodenum in consequence of food deficiencies are comparable to those which occur as a result of thyroid and adrenal insufficiency and may, indeed, be due in some part to the functional

derangements of these endocrine organs consequent on the food defects. The question arises whether partial long-continued avitaminosis may not be responsible in some measure for the production of chronic ulceration of these viscera. The food fault leads both to a state of lowered resistance in infection and ill-health of the stomach and duodenal mucosa, so that organisms, such as streptococci, swallowed by the mouth or arriving by way of the blood stream, might in this state become the more easily implanted on an area of eroded mucous membrane."

It will be noticed that the vitamine-starved monkeys suffered a great many of those ills which are characteristic of modern civilization. Among the effects produced by vitamine starvation were the very gastro-intestinal disorders which plague half the civilized people. It is worth noting that the author tells us that "one of the most constant results of food deficient in vitamines is colitis." Now colitis is, as Sir Arbuthnot Lane and others have convincingly shown, one of the forerunners of cancer. It is also worth noting that Colonel McCarrison says that "many of the other features of this malady, as seen in nervous constipated women, were reproduced in deficiently fed monkeys, such as the anæmia and the unhealthy skin and the loss of weight; even the congestion of the uterus and ovaries, which is so often present in women sufferers from colitis, was reproduced in monkeys."

Particularly interesting is the evidence that vitamine starvation leads apparently to "the production of chronic ulceration of the viscera" and to "ulcers of the stomach and duodenum," which in many cases are the hotbeds in which cancer grow, as

was shown by a large amount of evidence in the seventh chapter. Vitamine starvation is obviously one of the most fruitful causes of intestinal stasis, of internal ulcers and of cancers springing from them.

In view of the pernicious consequences resulting from vitamine starvation, I stated at the beginning of the sixth chapter:—"In my opinion cancer is due to chronic poisoning and vitamine starvation. I have some hesitation whether I should say that it is due to chronic poisoning aggravated by vitamine starvation, or to vitamine starvation aggravated by chronic poisoning." Experiments are needed to ascertain the influence of both vitamine starvation and chronic poisoning in the production of cancer.

It may be believed that Colonel McCarrison's experiments on monkeys and other animals are inconclusive. My critics may say that men may be differently affected from animals if the supply of vitamines is reduced. The outbreaks of beri-beri and scurvy among white men, described in the beginning of this chapter, show the terrific rapidity with which vitamine starvation can lead to acute suffering, disease and death. If intensified vitamine starvation leads rapidly to beri-beri, scurvy and death, we cannot be surprised if chronic vitamine starvation during a lifetime leads to physical degeneration, to the chronic poisoning of the system by auto-intoxication, and to cancer.

The *Japan Medical World* of the 15th May, 1922, describes in rather quaint English an experiment in vitamine starvation which was made on a number

of Japanese students who were fed on polished rice. We read:—

"At first there was aversion to polished rice and asked for something else, but later there was general aversion to food. When rice bran extract was given the desire for rice was increased as well as for the others. In the two cases out of the five there were rather continuous nauseas in the last half of the experiment; they did not vomit, however. All had feeling of distension or uncomfortable feeling in the stomach, except K., who was on the diet only five days.

"Constipation occurred in all the cases. We do not know if constipation preceded the sensory disturbances. Those who had bowel movement once or twice a day became constipated in two or three days on the diet and did not have the movement for four days or so. Of course the decrease of food intake and lipoid substances must be taken into consideration for the cause of constipation, but when alcoholic rice bran extract from which fat was removed was given, the bowel moved next day and sometimes it caused diarrhœa, and thence there was good movement. Thus it seemed that the principal cause for the constipation was due to the lack of some substance in the rice bran."

The report states that "constipation occurred in all cases," but that the bowels moved normally when the bran polished off the rice was given to the vitamine-starved students. Hence the report concludes that "it seems that the principal cause for the constipation was due to the lack of some substance in the rice bran."

Constipation is a characteristic companion of civilization. By "improving" our natural foods, by denaturalizing them, by feeding us on devitalized, embalmed and mummified foods our food chemists

have probably given a large number of diseases, among them cancer, to millions of men and women and have driven millions to an early grave.

Unfortunately our deadly food chemists, instead of abandoning their pernicious activities and allowing us to eat natural food in its natural condition, are now engaged in "manufacturing" vitamines in patent-medicine form and are persuading us to take their nostrums instead of the natural food which Providence has created. After having poisoned the world by starving us of vitamines, they may ruin us still further by their attempts to give us artificial substitutes for the natural food, the true composition of which they do not understand at present and may never understand in the future. There are secrets of Nature which are unfathomable, and the cooking pots and test tubes of the food chemists are very clumsy and quite untrustworthy instruments for analysing the true properties of the food we eat. Experience and instinct are a better guide in this matter than the pronouncements of blundering scientists.

Colonel McCarrison's brilliant book gives not only a full account of the results of vitamine starvation upon a large number of monkeys and other animals, but it gives a large number of illustrations. Among the most interesting illustrations are those in which the stomachs and bowels of normally fed and of vitamine-starved monkeys are placed side by side. The stomachs and intestines of the vitamine-starved animals are inflated, tortured out of shape and full of lesions, and the muscles, which are re-

quired for propelling food along the bowel, have shrunk very greatly or have completely disappeared.

The fact that vitamine starvation has similar results in human beings may apparently be seen not only by the enormous prevalence of similar conditions among civilized people, but not among primitive races which live on natural "unimproved" and "unscientific" food, but also by the condition of the arteries of civilized men. The tubes of our bodies, whether they carry blood or fæces, consist of similar material. The shocking condition of the whole tubular system of civilized men may be recognized by the rapid increase of arterio-sclerosis, a disease in which the arteries, which ought to be soft and flexible like well-made rubber tubes, become hard and brittle like rubber tubes which have perished by long exposure to the sun.

Arterio-sclerosis is another disease of civilization which, for all we know, is consequent upon vitamine starvation. The rapidity with which it is increasing in England and Wales may be seen from the rise of the death-rate, which during the last decade has advanced as follows:—

1912	148	per million
1913	185	" "
1914	210	" "
1915	235	" "
1916	241	" "
1917	265	" "
1918	268	" "
1919	281	" "
1920	287	" "
1921	330	" "
1922	380	" "

The figures given may, of course, have been affected to some extent by a better knowledge of arterio-sclerosis and by greater care in filling up death certificates.

In other civilized countries the death-rate from arterio-sclerosis has increased in a similarly startling manner, and if it continues advancing as it has done during the last few years, arterio-sclerosis may become more deadly than cancer.

In the opinion of Dr. Leonard Williams, 85 per cent. of the civilized people suffer from indigestion, constipation, and malignant diseases produced in them owing to vitamine starvation. That eminent physician stated in the *British Medical Journal* of the 31st July, 1920:—

"Here is a community of civilized individuals whose members, to the extent of about 85 per cent., suffer chronically from the cradle to the grave, from diseases and disorders of the bucco-gastro-intestinal tract. They suffer from dental caries, adenoids and tonsils, dyspepsias, pancreatic and hepatic disorders, appendicitis and constipation, and the long tract is dotted and punctuated with malignant disease. What is the cause? Now, if I were to state this problem to anyone present or to anyone with scientific training, I venture to say that his instant reply would be 'Enquire into the dietetic habits of this community, and correct some error which must be staring you in the face. . . .'

"If we know anything of vitamines, we know them to be contained in uncooked foods and absent, relatively, from cooked. And we know, too, that our community lives upon a diet from which uncooked foods are carefully excluded. They boil their milk, they steam their vegetables, they stew

their fruit. And they do these things from a combination of fear and pleasure. . . .

"The present dietetic scheme of our community has been dictated by fear and furbished by stupidity. The fear is the fear of the microbe. Now it is obvious to any one who will trouble to give the matter a moment's thought that the microbe becomes formidable only when he is furnished with a soil which is favourable to his development. If we offer him a soil which is inimical, he will languish and die. He may put up a fight and cause us the inconvenience of an acute disease, but so long as our soil is really inimical he cannot cause us a chronic disease. The most favourable soil for his purposes is the soil which is deprived of vitaminous foods. If you will carry your mind back, you will realize that we seldom heard of rickets, and never of adenoids and appendicitis, until we began boiling our children's milk and opposed our puny wisdom to the ingestion of raw fruit and vegetables. It is now admitted that a large part of the digestive processes are performed by bacteria. If all the bacteria are destroyed by cooking in a holocaust of brutal impartiality, where are the reinforcements of our effectives to come from? It is therefore not only our vitamines which are destroyed by cooking, but our other vitalizers. In our insane fear of our enemies, we slaughter our best friends.

"Now this intensive vitamine dietary, the exclusion, that is, of all cooked foods and drinks, is extraordinarily efficacious therapeutically. It not only assists other forms of treatment by improving the soil and reinforcing the defences, but it is of itself positively curative in most forms of chronic disease. The wonders which it works in what, for want of a better name, I may call the rheumatics, or middle-aged arthritis, are no less wonderful than the wonders of thyroid extracts in mycœdema. In diseases and disorders of the intestinal tract, including gastric and duodenal ulcer, its results equal anything in therapeutics with which I am acquainted. Under its influence, constipa-

tion and intestinal stasis completely disappear, and with them the host of maladies and symptoms to which Arbuthnot Lane has called attention."

Food in its natural condition may contain not only vitamines but may have other qualities little suspected by the majority of people and their qualities may be indispensable to our bodies. The eminent doctor, A. White Robertson, has made a special study of food, not only with regard to its vitamine value but he has investigated its electrical value as well. He stated in his remarkable book *Studies in Electro-Pathology,* London, 1918, on pages 24, 135 and 265:—

"Our chemists have misled us about calories and food values until challenged by the discovery of vitamines. Now we are seeking 'potted vitamines' instead of realizing the law behind them. . . .

"In the Wild all food cells, whether animal or vegetable, are taken into the stomach alive; that is to say, while yet electrically charged and before electrical death of the cell has induced chemical change. One might speak of such foods as 'quick' foods. The enzymes, the vitamines, are still present and active, and such food is electrically fit to take an active part in the hydrolysis and synthesis of the metabolism which shall make it into body tissue, or use it for energy. Not for nothing was flesh more than 48 hours denied to the Jew. Such flesh, though as yet undecomposed, was already electrically altered, so that diffusion had already commenced and early chemical changes had supervened. Herein lies the secret of food values; that all food for man should be so fresh that electrical change has not taken place, and that in its preparation it should not, whether by stripping or by over-heating, have had essential characters, necessary to life, removed.

"Food which is electrically discharged, and so no longer 'quick,' is not in a fit state for reconstitution by electro-chemical forces into corresponding body structures. Such food may be broken down into fuel for the energy of the body. It cannot contribute to maintenance. It is wholly irresponsive to elaboration and resynthesis. It is no longer possessed of affinities, whether electrical or chemical, and cannot therefore enter into physiological and histological combination. From such foods taken in excess are developed the toxins that determine disease, and their presence invites the presence of foreign septic organisms. . . .

"It has been the custom for many years to calculate dietaries upon the calorie-yielding capacity of the proteids, hydrocarbons, and carbohydrates of the foodstuffs in general use. If we had assurance that all foodstuffs taken into the body were converted into energy and into protoplasmic structure, we should by this system of dieting achieve perfect results and prevent waste. But with the loss of food energy of a vital, as opposed to a merely caloric, nature in the abstraction or destruction of the phospho-protein complex we find that our diets fail to energize and build up. Metabolism is in default, and wasteful, and toxic by-products of the food encumber the tissues, even replacing them, and accumulate as a pabulum for bacterial flora foreign to the alimentary system, and ptomaine, amine bases, and bacterial toxins, poison the whole machine through the blood and nervous system.

"The reports and returns of health officers, the statistics of tuberculosis dispensaries and sanatoria, the hospital returns of our actuaries, and the school clinics returns of our school medical officers are all evidence of a low national health standard. If we add to these the high infant mortality and the low birth-rate—decreasing pregnancies and increasing abortions due to low metabolism associated with toxicity of the thyroid—we arrive, perforce, at the conclusion that the nation is auto-intoxicated, high and low, rich and poor.

"Of what good are the artificial calorie values of foodstuffs such as we are forced to eat? They have no 'vital' value and they only serve to poison and to degrade the eater. The calculation of calorie value is only of use when dealing with fresh or sun-dried foods. I insist that the artificially 'preserved' foods are worthless, and more than worthless, for they are the cause of the national auto-intoxication. Let us realize that this auto-intoxication is the characteristic only of nations which subsist mainly upon this class of food. It is not a characteristic of nations who are independent of salted, steam-sterilized, frozen imports, and it is altogether unknown amongst primitive peoples and the creatures of the wild. . . ."

In the present chapter, vitamines have been considered only with a view to ascertaining what influence chronic vitamine starvation may have upon the genesis of cancer. I think I have proved indeed that vitamine starvation is an important cause of cancer.

Wrong feeding, apart from vitamine starvation, though connected with it, is one of the most potent causes of physical deterioration and consequent disease. The errors made in feeding by civilized men will be considered in two chapters, XII and XIII, when something further will have to be said on the subject of vitamines.

CHAPTER X

Chemical Poisons which are known to Produce Cancer, and Chemicals which may be Suspected

In Chapter VI it has been shown by a large number of examples and by authoritative quotations that continued absorption of certain poisons, such as arsenic, aniline, etc., is apt to be followed by cancer in very distinctive forms which breaks out, as a rule, only after 10, 20, 30 or more years, during which time minute quantities of these poisons have been absorbed more or less continuously. As I stated towards the end of that chapter, I dealt only with a few chemical poisons because they furnished an abundant mass of evidence showing that cancer is due to chronic poisoning not only in individual cases but in entire categories. In the present chapter I shall give details showing that various substances with which we come into almost daily contact are cancer-creating poisons, although their poisonous qualities are little known to the great majority of laymen, and that there are other substances with which we come daily in touch which may be suspected of being cancer-producers.

Coal seems to be relatively free from cancer-producing poisons. We may conclude this from the

fact that among coal-miners the mortality from cancer is no greater than it is among many other occupations. However, soot and a great many by-products of coal are extremely dangerous cancer-poisons. Let us first consider soot.

Until recently chimney-sweeps suffered from a peculiar kind of cancer, from cancer of the scrotum, which came to be called chimney-sweeps' cancer. It was suspected that cancer settled in that particular spot because it was difficult to keep it clean. Of late, chimney-sweeps' cancer has much diminished because the sweeps in England have learned that soot is very dangerous and they try to avoid contact with it. Besides, they may wash themselves more carefully than they did in the past. Soot is frequently used by gardeners. Gardeners who sprinkle it about the beds with their bare hands not infrequently suffer from cancer of the hands, which is undoubtedly caused by the soot, for the hand is a most unusual spot for cancerous developments, the principal exceptions being X-ray cancer, radium cancer and gardeners' cancer.

Soot and a great many by-products derived from coal are very dangerous cancer poisons. They seem to create the disease not by mechanical irritation but owing to the action of some poisonous chemical contained in it.

Dr. H. C. Ross of the Lister Institute stated in the *Journal of Cancer Research,* 1918, under the heading "Occupational Cancers":—

"Soot contains tar and tar oils. It is not gritty.

"It seems clear from clinical evidence that pitch warts

and epithelioma in the coal-tar industries are not due merely to mechanical irritation, for the more irritation, the less the disease.

"Since the predisposition is not due to mechanical injury, it is obvious that it must be due to chemical injury, which is borne out by the fact that it is the most concentrated form of coal, namely, soot, which causes the most disease, the incidence among the intermediate trades rising in exact ratio with the concentration. Thus coal causes no warts or cancer. Tar causes some cases. Pitch causes many more and soot causes a double mortality.

"Liquor carbonis detergens, creolin, etc., are used extensively on the skin. . . . They contain the middle fractions of tar which seem to be responsible for the proliferation (of cells) which leads to the warts in the industries."

I hesitate to accept Dr. Ross's statement that, as a cancer-creator, soot is more poisonous than are other coal derivatives. I have inserted his opinion because it briefly summarizes the position.

Tar, pitch, tar oil, and a great many other coal derivatives which are known to be highly poisonous and to be cancer-producers are in daily use everywhere. Our civilization is becoming indeed a coal-tar civilization. We tar our roads and creosote the woodwork in our houses. Most of our dyes, a great many perfumes, many drugs, saccharine, flavourings used in cooking, etc., are extracted from coal tar. In France coal tar in solution is frequently prescribed internally. Coal-tar soap is widely used. There may be some considerable danger in the free use of coal tar and of coal-tar products. Experiments are needed to show whether the use of coal-tar products is likely to produce cancer, and, until

their harmlessness has been proved, caution is called for.

Coal occasionally contains cancer poisons not only in the form of tar and its derivatives, but also in the form of arsenic which sometimes is found in coal. The fact that arsenic, if absorbed in minute doses during many years, is apt to produce cancer, has been shown by a considerable number of examples in the sixth chapter of this book. I give an extract showing that coal may contain arsenic, and that the industrial working up of such coal may result in a vast proportion of cancer deaths. In the *Bulletin de l'Association Française pour l'Étude du Cancer* for 1919, there is a paper "Le Cancer Arsenical" by Professors Bayet and Slosse, in which we read:—

"Arsenical cancer, which was described for the first time by Hutchinson in 1887, has remained until now a pathological rarity. The purpose of our paper is to show that arsenical cancer, instead of being rare, is very frequent, and that thousands of people, especially workers, are constantly threatened by it. We wish to start with an investigation into the making of patent fuel in which we engaged in 1916.

"Patent fuel is made by binding coal dust with tar. The works investigated showed an exceptional cancer frequency. Of the 13 workers employed, 3 were cancerous. A few months afterwards 2 further cancer cases appeared. There were thus 5 cancer cases among 13 workers, while 6 other workers suffered from warts which are the forerunners of cancer. In another establishment with a similarly small number of workers, 2 doctors assisted in the enquiry and discovered 3 cancer cases. . . .

"The coal which is handled by the workers contains

arsenic. Soot, tar, pitch, ammonia waters and aniline dyes, also contain arsenic. Coal and its derivatives are arsenical substances. An analysis of the air of the works where the men were employed, among whom 39 per cent. were cancerous, showed that it contained arsenic in the floating dust. An analysis was made of the hair, blood and urine of the workers. The hair of all the cancer patients contained arsenic and so did the blood and the urine in most cases. We also found arsenic in the nails and in the skin of one of the patients. In all the analyses arsenic was found in considerable quantities, far in excess of the physiological amounts. In order to make certain that arsenic was connected with working conditions and was not general in the district where the works were situated, the hair of workers in the neighbourhood not employed on patent fuel was analysed for arsenic with negative results."

In the small establishments investigated, an enormous proportion of workers had contracted cancer because it was not suspected that they were working in an atmosphere poisoned with arsenical dust. This case shows how carefully we must look out for poisons in extremely small doses which may not produce any ordinary evidences of poisoning but which may suffice to bring about cancer in 10, 15, 20, 30 or more years.

No doubt a great many substances which are not at present suspected of being cancer generators may bring about that terrible disease. One of these substances is paraffin in its cruder state, which, until lately, was freely used without any particular precautions. Dr. Archibald Leitch, the director of the Cancer Hospital Research Institute, London, gave an address on the causes of cancer, which will be found reprinted in the *British Medical Journal* of

the 7th July, 1923. Dealing with paraffin cancer he stated:—

"One of the oils used which induced epithelioma in mice was an unfinished lubricating oil, the possible dangerous properties of which no one had previously suspected.

"Southam and Wilson called attention to the occurrence of cancer of the scrotum in mule spinners, attributing it to the action of lubricating oils. I have reason to believe that cancer of the scrotum amongst mule spinners is much commoner than even their paper suggests, and we shall await with interest the results of the promised experiments with the particular lubricating oils used in the mills of Lancashire. Most of the lubricating oils in commerce are obtained from crude petroleum, and though not more than three or four cases of petroleum cancer are recorded in literature, it is probable that unrefined petroleum is just as dangerous as shale oil. It may be that the results of our experiments with petroleums, which are in contemplation, may be useful in preventing the risks, at present unappreciated, to man."

In the same lecture, Dr. Leitch, discussing arsenic cancer, stated that "probably it is commoner than we had suspected."

It is worth noting that Dr. Leitch does not share the opinion of those who believe, as do Professors Bayet and Slosse, who have just been quoted, that arsenic is the substance which causes cancer among those who come in contact with soot, tar and various tar derivatives. He stated in a paper written by him in conjunction with Dr. E. L. Kennaway, which was published in the *British Medical Journal* of the 9th December, 1922:—

"Professor Bayet of Brussels is a strong supporter of

the arsenic theory; he thinks that practically all our industrial cancers are due to the action of the arsenic contained, even in excessively small amounts, in the substances with which the workmen come in contact, soot, tar, pitch, paraffin and aniline derivatives. . . .

"The amount of arsenic in coal tar and paraffin is very small and there is no evidence that it is the tumour-producing agent in these substances; nor is there any good reason for the belief that arsenic, amongst all the various substances employed in the preparation of dyes, is responsible for the typical bladder cancer of aniline workers. . . ."

One of the most interesting chemical cancer-producing poisons is aniline. Its peculiar interest lies in this, that aniline dyes are universally used, and there is a possibility that not only workers in the aniline works may contract cancer, but that aniline dyes may not be without danger to those who wear clothing which is aniline-dyed. The possibility that clothing dyed with aniline may be a cause, or at least a contributory cause, in the production of cancer must be considered seriously. Lately many cases of troublesome eczema have attacked women who wore aniline-dyed furs on their bare necks and shoulders, and we have heard of many severe cases of eczema of the scalp due to the use of aniline hair dyes, etc.

I would like to show that workers employed in the manufacturing of aniline dyes are very liable to fall victims to cancer of the bladder, which is as characteristic among aniline workers as cancer of the scrotum is among chimney-sweeps and cancer of the hands among X-ray workers and gardeners. For some reason, which is not yet clearly under-

stood, certain cancer-creating poisons seem to gravitate towards the bladder.

The best summary account and survey of the position was made by Dr. Alice Hamilton, who published an important paper, "A Discussion of the Etiology of So-called Aniline Tumours of the Bladder," in the *Journal of Industrial Hygiene,* issued by the Harvard Medical School in 1921. She stated in it:—

"A long exposure to the chemical which is the exciting cause seems to be necessary. The statistics from Hoechst, Ludwigshafen, and Greppin show that the cases developing in the fuchsin department were in men who had been employed on an average from 12 years in Greppin to 19 in Ludwigshafen. Those who worked in the benzidine-napthionic department had had a shorter period of exposure, average 5 years in Ludwigshafen and 6 years in Greppin. Oppenheimer's patients had worked from 2 to 28 years, averaging 18 years. The 2-year case, which was far below the average, indeed the shortest exposure on record so far, occurred in a man who worked in the benzidine department.

"Both Curschmann and Oppenheimer find that there is no connection between the length of exposure and the malignant character of the growth, nor is there any relation between the particular compound causing the tumour and the character of the tumour. Oppenheimer observed 6 men who had worked together in the same room for 20 years; 2 were healthy, 2 had been operated on for bladder tumour and had recovered, and the last 2 had died from bladder tumour.

"Of Curschmann's 26 cases, one developed after 5 years, six after 5 to 10 years, six after 15 to 30 years, and thirteen after more than 30 years' employment. The Basel cases did not begin to appear till the industry was 16 to 17

years old, and in England, the only dye works in which information about bladder tumours among the men can be obtained is the oldest one, more than 20 years old.

"One very interesting feature of this variety of bladder tumour was brought out by Leuenberger and confirmed by Schwerin and by Oppenheimer, namely the fact that the tumour may develop long after exposure to the exciting cause has ceased. Leuenberger tells of a man who worked in benzidine for 7 years, had cystitis, and was transferred to another department, where he worked for 2 years. He then left the factory and 2 years later blood appeared in the urine and he was operated on for tumour of the bladder. Schwerin of Hoechst reports two similar cases: one a man who worked 5 years in the benzidine-napthionic department and 23 years later had tumour of the bladder; the other a man who worked 11 years in aniline and 8 years after leaving the factory had a tumour removed from the bladder. Oppenheimer saw tumours develop 10 years and 17 years after the men had left the factory.

"It seems from the observations of Nassauer and of Oppenheimer that an extremely slight exposure to the exciting cause is sufficient. Oppenheimer had three cases which developed in men who never came in contact with the chemicals but who worked in rooms adjoining the process department. These cases were slow, the tumours developing after 20 to 26 years. . . .

"According to Nassauer, the irritative substance is always aniline mixed with air. The condition is always produced by fumes containing a quantity of aniline which is too small to set up clinical symptoms of intoxication, but which, dissolved in the moisture of the alveoli of the lungs (aniline is 3 per cent. soluble in water) penetrates the cells and reaches the lymph stream or the blood. A very dilute mixture of aniline with air, such as is breathed by men working in a room next to the one containing the stores of aniline, causes a more rapid tumour growth than does a larger quantity of aniline in the air, and the

men who work out of doors, getting only minute quantities of fumes from the nearby building, have an even shorter latent period. Nassauer considers the action of aniline so powerful that one year's exposure to the fumes is too long, and since 1904, in the factory under his charge, he has permitted only three months' employment in the benzidine department, in his opinion the danger spot."

The fact that cancer poisons cause the disease as a rule only when individuals have been exposed to their action during a great many years, that they are cumulative poisons which have been absorbed during a long period of time in infinitesimally small and apparently harmless doses, may be seen from Dr. Hamilton's statement that men contracted cancer on an average after 12 years' work at Greppin, after 19 years' work at Ludwigshafen, after from 15 to 30 years in the cases described by Curschmann, after from 20 to 26 years in the cases described by Oppenheimer, etc. The cumulative effect of chemical cancer-poisons may also be seen by this, that Dr. Hamilton described several cases of typical aniline cancer which broke out many years after the workers had left the aniline works in which they had been employed.

Only a few are aware how powerful some of the poisons are which are extracted from coal tar and which are in daily use everywhere. Cases of acute aniline poisoning are not infrequent. In volume 66, page 1441 of the *Journal of the American Medical Association,* 1916, we read in a most interesting article, entitled "Industrial Anilin Poisoning in the United States," written by Rey Vincent Luce, of

hundreds of cases of aniline poisoning having occurred from insignificant quantities of that most deadly stuff. The author reviews the position as follows:—

"Industrial poisoning from aniline and substances closely allied to it has long been recognized in Germany, where the manufacture of aniline dyes is an enormously important industry, and the possible effects on the workmen of the various substances used or evolved during such manufacture has there been a study since the 'sixties.' . . . As we know, there was no attempt in this country to compete with Germany in the manufacture of aniline colours or of aniline itself till the war shut off the supply and forced us to begin to make for ourselves what had heretofore been obtained from Germany. . . .

"The sudden introduction of these industries brings new problems before physicians and sanitarians. Making aniline from coal tar involves exposure to poisons that are new to us in America. . . . The workmen employed in this industry are exposed to highly poisonous volatile compounds. . . .

"Grandhomme, who was for many years attached to the great dye works at Hochst, reported 128 cases of industrial poisoning there, 109 of which were caused by aniline. Leymann, who does not name the factory with which he was connected, gives a record of 171 cases of aniline and toluidin poisoning and 101 from nitrobenzene and its allied bodies. . . .

"Industrial aniline poisoning, which a few years ago was negligible in this country, has suddenly assumed decided importance. So far the making of dyes is too new to have furnished any reported cases; those which are on record come from the rubber industry and from the use of a wash for printers' ink which has aniline as one of its ingredients. It is impossible to say how much of this substance is used in the United States, or even to say

how many plants used it, for the making of rubber, and even more the reclaiming of rubber, is an industry fairly hedged about with trade secrets. That is why it was so difficult for Akron physicians to trace this kind of poisoning to its source. It is, however, well known in Akron now, and common enough, for the victims to be familiarly known as 'blue boys' from the cyanosis which is so prominent a symptom. Since the discovery of the cause of the trouble, the rubber manufacturers have taken measures for the protection of their men, either by installing exhaust ventilators, or simply by warning them to seek the open air as soon as flushing of the face and violent headache come on. It is said that there is now far less serious poisoning in Akron rubber works. . . .

"Every medical student is familiar with the aniline oil which he uses as a cleaning fluid for stained specimens, that golden brown oil with its pleasant nutlike odour. Unlike most volatile poisons, it gives no warning of its character, for it does not irritate the eyes and throat and is apparently as harmless as cedar oil. Yet, according to the researches of K. B. Lehmann, aniline is toxic in even smaller doses than are benzine, chloroform or carbon disulphid. Toxic symptoms follow the inhaling of from 0.1 to 0.25 gm. of aniline, while it takes from 1 to 1.1 gm. of carbon disulphid to produce symptoms of poisoning. Aniline volatilizes at room temperature; the boiling point is high, 182° C.

"Krause has reported two instances of poisoning from insignificant quantities of aniline. The men were working in a Zeiss Optical works in Jena, testing the clarity of rock crystals by dipping them in small receptacles containing aniline and then holding them up to the light. One man worked alone in a small room and he felt the effects at the end of his second 2-hour shift, complaining of nervousness and exhibiting a marked cyanosis of the skin and the mucous membrane. The second was in a larger room in which the fumes were more diluted, and he worked almost

4 hours before becoming cyanosed. The blue colour increased in intensity after a second day's work.

"Still more striking in this connection is a non-industrial case related by Trespe of a little boy who breathed what must have been a very slight quantity of fumes and developed marked symptoms. He slept in the same bed with his elder brother, who just before going to bed had rubbed some aniline on his frost-bitten fingers with the result that he himself was severely poisoned and the little fellow moderately poisoned. . . .

"The poison may enter the skin or the lungs, more often by both ways. Birge's cases are instances of pure skin absorption. The two painters were using aniline black paint, applying it with a brush and then washing the surface with hot water and soapsuds. There were no fumes, but both men were seized with nausea, general weakness, palpitation of the heart, then violent headache with vomiting in one case and diarrhœa in the other. Both passed dark-coloured urine. The skin was very pale, the lips blue. The next day they were able to go back to work, and by wearing rubber gloves, they avoided a repetition of the trouble.

"On the other hand, von Haksch reports a case of pure respiratory origin:

"A boy of 17 years set to work for the first time mixing aniline with other compounds in an open receptacle. Headache came on almost at once, and after four hours' work he was forced to seek the open air. He went home, and a physician, summoned some hours later, found him in coma, deeply cyanosed, with a weak, rapid pulse and dyspnea. Edema of the lungs developed and did not clear up for 4 or 5 days. The coma lasted several hours. In this case, aniline could be detected in the urine.

"The greater number of industrial cases follow the spilling or splashing of aniline over clothes or skin and doubtless both skin absorption and lung absorption play their part."

How extremely poisonous aniline is, even in the minutest quantities, may be seen by the account of two boys becoming poisoned by breathing the fumes which came from the frost-bitten fingers of one of them who had rubbed on a little aniline before going to bed. The author makes it clear that most cases of industrial aniline poisoning are due to spilling aniline over the clothes and that the skin readily absorbs the deadly liquid and the lungs the deadly fumes emanating from it.

The cases quoted are only a small selection from a vast number on record. They show that aniline and aniline dyes are among the most dangerous substances existing. For all we know, we absorb day by day and night by night poisonous fumes from the aniline-dyed objects which surround us. The quantities absorbed may be so minute that they never give rise to the characteristic symptoms of aniline poisoning. However, there is the possibility that they may either cause cancer or assist in causing cancer. The question whether aniline-dyed objects are able to poison us ever so slightly should be investigated without delay. Chronic poisoning is far more terrible than acute poisoning. The former is apt to give us long-continued-sufferings, while the latter results only in brief illness and death.

Chemical poisons are sometimes responsible for the formation of cancer in very unusual sites. Cancer of the cheek is very rare in all countries, except in those where betel-chewing is habitual. Betel-chewers chew a mixture of betel, lime and

crude tobacco. One of these substances contains obviously a subtle poison which in the course of time produces the dread disease in the cheek, but apparently chemical science has not yet succeeded in discovering the actual inciting cause.

Cancer of the penis is extremely rare in most countries, but it is frequently found in certain parts of India and of China. The *Journal of Cancer Research* printed in 1919 an interesting paper on "Cancer in Hainan," written by Dr. Bercovitz, which contained a lengthy account of the incidence of cancer in that province, accompanied by statistics of cancer cases. Commenting upon these statistics, Dr. Bercovitz wrote on pages 231 and 232:—

"The most noticeable feature of table 2 is the high percentage of carcinoma of the penis. Except for the high incidence of syphilis among the Chinese male population and attempts to cure the primary sore by the application of highly caustic remedies, no reason can be assigned for this large figure.

"Under the heading of 'skin' are grouped all the cancers of the skin covering the extremities and the trunk. These are often encountered, perhaps because ulcers of the arms and legs are very common in China. The ulcers are treated, not by cleansing and the application of healing remedies, but by the crude native methods of applying plasters, either of mud mixed with cow dung, or of leaves enclosing irritating substances. As a result they eat deeply into the flesh, and heal, if they heal at all, with contractures of the muscle sheaths and consequent deformity; or they produce an exuberance of scar tissue with the formation of keloids; or they degenerate into malignant growths. Counter-irritation is extensively practised by the Chinese with the idea of driving out the evil spirits supposed to

be the cause of the disease. The counter-irritation takes many forms, one of which is the piercing of the skin. The resulting wound is always infected and in healing may degenerate into a malignant growth.

"Two locations, so common in America and many other countries, are strikingly conspicuous by their absence from this list; the stomach and the uterus. Ulcer of the stomach is rather infrequent. And as it has been shown by Rosenow and others that gastric ulcer is the result of streptococcic infection, it will be of further interest to know that scarlet fever and diphtheria are not known in Hainan and that appendicitis and acute articular rheumatism (non-gonorrheic) are only infrequently met with. In the absence of much gastric ulcer, therefore, the cases of cancer of the stomach might be expected to be few. It is also of interest to know that the gastric crises of tabes dorsales and general paresis are very rarely seen, notwithstanding the widespread incidence of syphilis and its very destructive tertiary lesions."

While Europeans and Americans suffer chiefly from cancer of the stomach and the uterus, largely because they are vitamine-starved, as has been shown in the preceding chapter, cancer of the stomach and the uterus, "are strikingly conspicuous by their absence" in Hainan, and for the same reason "ulcer of the stomach is rather infrequent." While Europeans and Americans become sodden with cancer poison in consequence of vitamine starvation, which leads to lesions throughout the alimentary tract and to chronic constipation and which opens numerous doors for the constant absorption of self-created poisons by the system in the manner described by Sir Arbuthnot Lane, the Chinese of Hainan suffer principally from cancer of the penis and

of the skin, which are very rare in the United States and in other countries. The frequent occurrence of cancer of the penis and of the skin in Hainan is explained by Dr. Bercovitz by the Chinese habit of applying "highly caustic remedies" and "irritating substances which eat deeply into the flesh" in cases of syphilis and of various skin diseases. These irritating substances are probably highly poisonous, and very likely arsenic, or some other poison which is known to be a cancer generator, is the principal factor in bringing about cancer in the unusual sites mentioned.

We know now that various powerful chemical poisons, if absorbed in very minute quantities during a long time, do not bring about the usual phenomena found in the case of poisoning, but that they act cumulatively and bring about cancer. We are therefore entitled to suspect all the poisons which we are made to absorb in small quantities, even if scientists assure us that the minute quantities which get into our system are "perfectly harmless." These "perfectly harmless" quantities may indeed not bring about the orthodox consequences associated with poisoning, but they may in 10, 20, or 30 years lead to cancer. It seems quite possible that the unsuspected poisons which we habitually absorb are far more deadly than those which we know as cancer-producing poisons.

In the sixth chapter, cases of paraffin cancer have been described. Petrol, or gasolene, as it is called in the United States, is extracted from the crude oil. Danger may possibly lurk in the petrol can.

The use and the abuse of tar derivatives and of petroleum and its distillates have increased enormously during the last few decades, and especially in the course of the last few years. Modern civilization may almost be described as a tar and petrol civilization. Tar derivatives provide us with a large number of poisonous dyes, poisonous drugs, and poisonous disinfectants, some of which, for all we know, may act as cancer producers. We breathe in tar fumes from our tarred roads, creosote fumes from the creosoted woodwork of our houses, and aniline fumes from our wallpaper, clothing, furniture coverings and so forth. With the rapid increase of motor-cars, the atmosphere of our towns is becoming laden with petrol fumes, and the question must be asked whether emanations from substances which are known to be acutely poisonous and which are derived from materials which are known to cause cancer are safe or unsafe, whether they are, or are not, contributory causes in the production of cancer.

I have shown by a large number of examples given in the sixth chapter of this book that numerous individuals and entire classes of workers develop cancer only after having been exposed to various chemical poisons during 10, 20, 30 years or more.

My contention that cancer is the result of chronic poisoning which has continued during a long period of years is confirmed by the seventh chapter, in which I have shown that cancer is not only produced by long-continued poisoning from without, namely by chemicals and burns, but also by long-

continued poisoning from within, by auto-intoxication from the bowel which has gone on more or less continuously for decades.

Aniline dyes, tar-derived and highly poisonous disinfectants, drugs, etc., and fumes of petrol distilled from raw petroleum, which is known to be a cancer producer, may therefore likewise be cancer poisons which bring about that terrible disease only after 10, 20, 30 years or more. For all we know, people working in, or living near, garages may develop cancer only in 10 years or 30 years from now, and our petrol-fume-laden towns may become hotbeds of cancer, veritable cancer death-traps. At any rate, the pollution of the town air by petrol fumes cannot be good. Men need fresh air, but we destroy it, and the result must be the weakening of the air-starved inhabitants. That seems clear to me.

With incredible recklessness we absorb deadly poisons in a diluted form day after day, week after week, and year after year, and, as far as I know, I am the first who raises a warning that we may be sowing the seeds of cancer among millions of people. The possibility of chemical dyes, tar-derived drugs and disinfectants and of petrol fumes being cancer producers should be investigated without delay. That research seems to me infinitely more necessary than the numerous experiments which are being made on the lower animals in the research establishments throughout the world.

CHAPTER XI

Do Chemical Preservatives in Food Cause Cancer?

Until quite recently the causation of cancer was a complete mystery. In 1887, Sir Jonathan Hutchinson delivered a remarkable lecture describing some cases of cancer which had obviously been caused by the absorption of arsenic in the course of a great many years. An extract from that lecture was given in the sixth chapter of this book. Many rushed immediately to the conclusion that all cancer was caused by arsenic, and even now there are people who endeavour to find in arsenic one of the principal causes of the disease. It is true that arsenic is contained in many minerals, and frequently gets by devious ways into our food and drink. Of this some instances will be given in the course of this chapter.

More recently it was discovered that cancer was caused not only by chronic arsenic poisoning extending over 10, 20, 30, or more years, but that very distinctive cancers resulted from chronic poisoning by tar, pitch, aniline, crude petroleum, and various other substances. Numerous examples were given in Chapters VI and X, showing that many indi-

viduals and entire categories of workers fell a prey to a specific kind of cancer after having been exposed to some poison or poisons for a decade or two or longer.

The fact that cancer is brought about by the absorption of minute doses of poison over very long periods of time was confirmed by experiments on animals. The tarring of mice, rats, and rabbits results in cancer after a period of time which corresponds with a period of 20 or 30 years in the case of man. That has been shown towards the end of the sixth chapter. Countless cancer deaths can clearly be traced to internal poisoning, to autointoxication, as has been shown in the seventh chapter, and the persons who have developed cancer in consequence of self-poisoning have, as a rule, been exposed to the harmful action of the self-created toxins from the bowel during decades.

Cancer is obviously caused by chemical and bowel poisons which enter the body in such minute doses that they do not give rise to the usual symptoms of poisoning, for otherwise people would take precaution against them. They are absorbed day after day and year after year in infinitely small doses, but these small doses have a cumulative effect, and result, not in orthodox poisoning, but in protracted illness and death by cancer.

During the last few decades the number of cancer-creating poisons known to medical science has rapidly increased, and we have no reason to believe that we now know all the cancer-producing sub-

stances. We must, therefore, reckon with the possibility that a good many other poisons may have a cumulative cancer-producing action, and we ought to beware of the daily absorption of substances which are well-known poisons, even if scientists solemnly assure us that the small quantities in which they are taken are "quite harmless."

For centuries civilized men have consumed tea, coffee, and tobacco. All three contain very strong poisons. Hence cancer has frequently been attributed by some to the ever-increasing consumption of these stimulants. However, there is apparently very little cancer, except skin cancer, caused by poisonous irritants, in large portions of China, where tea has been consumed in enormous quantities for thousands of years. There is likewise very little cancer among the native Arabs, who, for centuries, have been great consumers of coffee, and in coffee-drinking Turkey also cancer is relatively rare. There is practically no cancer among the North American Indians, who have been, and are, heavy smokers. Confirmation of my assertion relating to the rarity of cancer among the Chinese, among the Arabs, and among the North American Indians, will be found in Chapters III and X of this book. There seems, therefore, little justified cause for the belief that cancer is caused by the consumption of tea, coffee, and tobacco. The fact that the consumption of alcohol has little influence upon cancer has been shown in the first chapter.

While the poisons contained in tea, coffee, to-

bacco, and alcohol have apparently little, if any, influence in the causation of cancer, we are justified in considering the daily absorption of preservatives in food with the gravest suspicion. During the last few decades, when the cancer death-rate has increased very greatly, the consumption of preserved food also has greatly increased.

Food is preserved by heating and canning, by freezing it, by drying or smoking it, by treating it with sugar, salt, and vinegar, and by adding to it various chemical preservatives. The old-fashioned methods of preserving may possibly be innocuous. There are certain objections to tinned, frozen, and chilled foods, which will be considered in the next chapter. In the following pages the question will be raised whether the chemical preservatives and other poisons connected with food which civilized men consume every day and in ever-increasing quantities may, or may not, be a direct, or at least a contributory, cause in swelling the cancer death-rate.

The increased use of chemical preservatives, most of which are irritant poisons, was exceedingly well summed up in a letter written by that distinguished analytical and research chemist, Mr. Otto Hehner, of the firm of Hehner & Grimwood, of London, which was published in *The Times* on the 20th September, 1923:—

CHEMICALS IN FOOD.

Increasing Use of Preservatives.

An Analyst's Views.

To the Editor of "The Times."

Sir,—During the last fifty years a profound change has come over our food-supply. Formerly food material came more or less direct from the farm to the kitchen; now a very large portion of it passes through factories in which it is prepared, preserved, and beautified, and incidentally made dearer. This change has been accompanied by the introduction of a large number of insidious poisons or physiologically active substances. Their quantity in each food article is so minute that positive and obvious injury is out of the question, but their cumulative effect in the course of years, or even of a generation or two, is bound to become visible. That stage appears to be approaching, or even to have arrived. *Gutta cavat lapidem.* The manufacturers acted in all innocence, and no reflection is here meant to be cast. Ignorance and human limitations are to blame.

For ages wine and beer barrels have been "sulphured" to repress fungoid growth, a stupid practice, but excusable while scientific knowledge did not exist. Now sulphites (products of burning sulphur) are regularly mixed with beer and other beverages, are used by butchers to keep the meat free from "taint," dried apricots, some tinned fruits and raisins, are bleached with sulphurous acid, and gelatine meant for culinary purposes is sometimes treated with it. Sulphurous acid and sulphites have marked

physiological action. Sulphur is most frequently accompanied with more or less arsenic, which thus follows in the wake of "sulphuring."

"Butter, cream, margarine, bacon, and the manifold preparations into which bacon enters (sausages, meat pastes, etc.), contain boric acid or borax. This is limited in butter to 0.5 and in cream to 0.4 per cent. Chinese eggs, imported in bulk, contain up to 2 per cent. of boric acid, and thence go into cakes and pastries. Temperance beverages—ginger-beer, lime-juice, and such-like—frequently contain salicylic or benzoic acid; 7 grains per pint are required for effective "preservation." Margarine has been known to contain this poisonous material, sodium fluoride. Chilled meat has been imported, shiploads full, fumed with formaldehyde, a powerful and undoubtedly injurious chemical. Flour is bleached with nitrous gases, which are injurious without question.

Every article of food preserved in a tin canister dissolves some of the tin coating of the metal and becomes contaminated with tin in quantities depending upon the acidity of the material, the time of contact, and the quality of the tinplate. Condensed milk takes up a mere trace, acid fruits quite tangible amounts. From every sample of tinned food, without exception, weighable traces of tin can be separated. Tin is physiologically active.

The majority of organic acids used in food preparations, such as tartaric acid and citric acid and cream of tartar, contain traces of lead acquired from leaden vessels or chemicals used in their manufacture. These traces are small, but by no means negligible. The British Pharmacopœia allows twenty parts per million to be present. Preserved peas, beans, and spinach contain copper, added for beautifying purposes in the form of crystallized sulphate of copper, 1 to 4 grains per pound.

Rice is covered for beautification with French chalk. Flour is "improved" by the addition of acid phosphates,

liable to contain traces of arsenic. Last, but not least, comes arsenic. We live in the age of coal. Almost all, nay all, coal is arsenical. In consequence, arsenic is ubiquitous. Every particle of coal dust or ashes, every tintack, and every metal-cooking vessel, is slightly arsenical. Few manufactured food materials or food ingredients are entirely free from it. The glass of white bottles contains it, and gives it up to some of the substances stored in them, whence it also enters into food. The Royal Commission on Arsenical Poisoning, recognizing this ubiquity, limited the permissible quantity to 1/100th grain per pound in solid and 1/100th grain per gallon in liquid foods.

Clearly we are bombarded with chemicals and poisons in minute quantities at a time, but at all meals. No organism can stand it indefinitely. All these facts have been represented by public analysts in their quarterly or annual reports for many years past without tangible effect upon Legislature. No other national question cries so urgently for a remedy, not for reports by Committees or Royal Commissions for burial in Blue books.

Yours obediently,
OTTO HEHNER.

The Laboratory,
11, Billiter Square, E.C.3.

Mr. Hehner's note of warning was more than justified. As he truly said: "We are bombarded with chemicals and poisons in minute quantities at a time at all meals. No organism can stand it indefinitely. No other national question cries so urgently for a remedy."

It may possibly be believed that Mr. Hehner is an alarmist. However, to readers of this book, the consumption of "chemicals and poisons in minute

quantities at a time at all meals" must appear to be a very questionable, if not a very dangerous, practice. Towards the end of his letter the writer stated that the danger had been pointed out "by the public analysts in their quarterly or annual reports for many years past without tangible effect upon Legislature." There are indeed reports innumerable on this subject, accompanied by carefully reasoned objections and protests which have been disregarded.

In order to show the gravity of the position, and the attitude of public analysts and health officers towards it, I would now quote a part of a report of Dr. Reginald Dudfield, Medical Officer of Health to the London Metropolitan Borough of Paddington, dealing with preservatives and foodstuffs, and dated 23rd December, 1922. Dr. Dudfield stated in his exceedingly able report, which should deeply impress every reader:—

"All the preservatives discovered to be in use are drugs for the majority of which the British Pharmacopœia lays down limits for use in prescriptions. While admitting that the quantity of any of the drugs used for preserving taken with any one food usually falls notably below the maximum dose laid down by the Pharmacopœia, it has to be remembered:

"(*a*) That certain individuals manifest an intolerance to certain drugs, which intolerance cannot be ascertained except by exhibition of the drug.

"(*b*) That the effect of drugs used as preservatives on the human system, and particularly on the digestive tract, is still an undetermined question.

"(*c*) That the action of some drugs is known to be cumulative, i.e. while one or two doses may give rise to no symptoms, continuous consumption of such small doses may suddenly give rise to severe constitutional disturbance; and

"(*d*) That sick persons and young children are particularly affected by the majority of the drugs used as preservatives.

"In these days of rapid transit, the addition of any chemical preservative to foodstuffs ought, I believe, to be unnecessary, or only permissible in special cases and subject to stringent regulation. If proper care be exercised in the preparation of the commodity—especially as to freshness of material and cleanliness of utensils used in manufacture and of receptacles for storage—the majority of foodstuffs should be on the retailer's counter before putrefaction can take place. It is to be feared that in many instances preservatives are used to disguise incipient putrefactive changes or to counteract the possible results of lack of care in the preparation of the foodstuff rather than to prevent putrefaction after manufacture.

"Temperature of the air or shop is the principal factor causing decomposition in foodstuffs prepared and put up under satisfactory conditions. That factor can be successfully combated by storage in cool places, resort being had to ice or artificial low temperatures in hot weather. Within reasonable limits storage at low temperatures can be relied upon to preserve all foodstuffs without injury to their appearance, taste, etc., and without giving rise to any secondary products harmful to the consumer.

"Whatever may be the ultimate decision as to the wisdom of using drugs as preservatives, there can, I think, be no room for doubt as to the need of control of the quantity to be added to any foodstuff. If, as in the case of butter, a 'trace' of boric acid per pound has been proved to be sufficient to ensure the butter being placed on the market

in a condition fit for sale, no argument can, I venture to submit, be adduced in support of the addition of 140 grains per pound. . . .

"For the purpose of this report, enquiries have been issued to the Medical Officers of Health of the Metropolitan Cities and Boroughs and of Administrative Counties. Replies have been received from 109 of these Areas, of which 95 yielded information which could be used. In 18 instances (13 County Boroughs, 5 Administrative Counties) it was stated that, owing to the uncertainty attaching to the law, no sampling had been done for the discovery of preservatives.

"The information asked for was intended to throw light on the varieties of food commodities in which preservatives had been found, and on the quantities of preservatives determined as present in such commodities. The replies gave, therefore, the numbers of samples of each commodity containing preservatives, without reference to the numbers found to be free thereof. The information supplied in the majority, but not all, of the replies received, referred to the three years 1919, 1920, 1921.

"The results of the enquiry are summarized in Appendices B and C. The former gives the totals for the Country generally, and the latter, data as reported from Metropolitan Areas, County Boroughs, and Administrative Counties.

"Comparison of Appendices A and B suggests that more foodstuffs are 'preserved' now than in 1899-1901. The maximal quantities added to the foodstuffs are in many instances greater, as also the differences between maximum and minimum quantities. Appendix C suggests that in districts where sampling is actively undertaken the quantities of preservatives added tend to be less. The one satisfactory feature of the returns is the disappearance of formalin.

"It would be easy to construct an imaginary meal which should contain an amount of preservative much in excess of the pharmacopœial dose of the drug used."

From the Appendix tables I would extract the following extraordinary details:—

AMOUNT OF PRESERVATIVE (IN GRAINS PER POUND OR PINT)

	Preservative Used	Maximum	Minimum
Brawn, Bacon, Cooked Ham...	Boric acid	35.0	3.5
Cake, excluding Sponge.....	Boric acid	45.5	3.5
Butter.....	Boric acid	140.0	Traces
Sponge Cake.....	Boric acid	16.1	9.8
Coffee and Chicory Extract....	Sulphur dioxide	5.0	1.5
Condiments.....	Salicylic acid	1.3	0.64
Eggs, Liquid and Dried.....	Boric acid	154.0	3.7
Jam and Marmalade.....	Salicylic acid	10.0	0.4
Jellies, Table.....	Salicylic acid	5.2	0.5
Lemon Cheese.....	Boric acid	17.6	Traces
Lemon Cheese.....	Salicylic acid	3.0	0.2
Lemon Squash.....	Salicylic acid	13.1	0.06
Margarine.....	Boric acid	38.5	Traces
Mincemeat.....	Salicylic acid	2.8	0.6
Fish Pastes.....	Boric acid	105.0	Traces
Meat Pastes.....	Boric acid	42.0	Traces
Sausages.....	Boric acid	110.6	1.4
Sausages.....	Salicylic acid	17.5	2.1
Vegetables in tins.....	Copper sulphate	3.2	0.2
Wines, English.....	Salicylic acid	11.4	Traces
Wines, English.....	Benzoic acid	5.7	5.2

With great reserve Dr. Dudfield pointed out that most preservatives found in food are drugs known to the Pharmacopœia which can safely be used only in limited quantities, that their effect on the human system "is still an undetermined question," and that "the action of some drugs is known to be cumulative." He also drew attention to the fact that

preservatives are used not only to keep food fresh, but "to disguise incipient putrefactive changes," a most undesirable proceeding. Moreover, he pointed out that in some cases poisonous preservatives are added to food with indiscriminate recklessness. He supported his assertion by a lengthy table, part of which has been reprinted in the extract given above, and he told us at the end of his report that "it would be easy to construct an imaginary meal which should contain an amount of preservative much in excess of the pharmacopœial dose of the drug used." His report was based not merely upon observation of the district for which he acted, but was founded upon enquiries made from a large number of local authorities. Therefore the conditions revealed by him may fairly be considered representative of all England. For this reason Dr. Dudfield's report is particularly valuable.

The objections to poisonous chemical preservatives in food made by Mr. Hehner and Dr. Dudfield are echoed by hundreds of highly qualified experts. From the vast quantity of material in my possession I would select only a few telling pronouncements.

Dr. Harvey W. Wiley, one of the most eminent food chemists living, and one of the ablest scientific officers of the United States Government, stated in his standard work, *Foods and their Adulteration* (G. & A. Churchill, 1917), under the heading, "Preservation by Means of Non-Condimental Chemical Preservatives":—

"The use of non-condimental chemicals in the preservation of meat is practically an industry of the last quarter

of a century. Up to that time the use of non-condimental chemicals was practically unknown in the meat industry. The chemicals employed are those known as germicides. In the quantities used they neither impart a taste nor odour to a preserved meat, but by their germicidal properties prevent the development of organic ferments and thus make the preservation of meat far more certain and very much less expensive. By the use of some chemicals, the salting, sugaring, and smoking of preserved meats may be done with very much less care, in a much shorter time, and at a very greatly reduced expense. For this reason the practice has gained a great vogue, not as a means of benefiting the consumers, but rather as a means of enriching the packer and dealer. Chemical preservatives are also highly objectionable, because they keep meats apparently fresh, while in reality changes of the most dangerous character may be going on. They thus prevent the display of the red light danger signal. . . .

"The use of any kind of chemical preserving agent is most reprehensible, no matter what it may be. Unfortunately, experts differ respecting the influence of these chemical preservatives upon health. The users of chemical preservatives have employed experts of known fame and distinction to testify in favour of these products, while the consumer, perhaps, is not able to go to the expense of securing expert testimony, and, therefore, as regards numbers of witnesses, at least, chemical preservatives have the advantage. In a case of this kind, the accused must be considered guilty until proven innocent. It is not sufficient to prove in a given case that borax is not injurious. If by proving that it is injurious in a single case, conviction must ensue. . . .

"No expert would testify that borax has never been injurious—even those who appear in its favour admit that —but plead that it is generally used in small quantities, and therefore cannot be harmful."

Dr. Wiley shares the opinion of Dr. Dudfield,

telling us that "the use of any kind of chemical preserving agent is most reprehensible, no matter what it may be," and informs us that chemical preservatives are highly objectionable, because they disguise "changes of the most dangerous character which may be going on." On page 55 of his book, he tells us that of the preservatives principally used, "all have been shown to be deleterious to health," and that the various colouring matters employed "are highly objectionable, not only on account of deception, but on account of being injurious to health." On the page indicated we read:—

"*Preservatives.*—The preservatives which are principally used in meat are borax, boric acid, sulphite of soda, and benzoic acid. All of these preservatives have been shown, by the work of many investigators, to be deleterious to health. They should be rigidly excluded from all meat as well as other food products.

"*Colouring Matter.*—Dyes are frequently used for colouring sausage and other minced meats. All such dyeing materials are reprehensible, both on account of health and deception. Preserved meats gradually lose the natural red tint of the fresh meat, and to that extent the colour is an index of the time during which they have been preserved. Inasmuch as consumers prefer fresh meats preserved as short a time as possible, they are deceived, and to that extent injured by the use of dyestuffs which impart to preserved meats a fresh appearance.

"*Indirect Colouring Matter.*—Certain chemicals, which of themselves have no colour, serve to fix and hold, or even accentuate, the natural color of meat. The two principal chemicals used for this purpose are saltpetre and sulphite of soda. Saltpetre is used generally in preserved meats to retain and accentuate the red colour thereof. Sulphite

of soda is used principally on fresh meats, where it acts both as a preservative and as a retainer of colour. Sprinkled over a freshly cut surface of fresh meat, sulphite of soda preserves the red tint and the customer thinks it has just been cut. In this way he is deceived. Both of these substances are highly objectionable, not only on account of deception, but on account of being injurious to health. In the case of saltpetre, the general opinion concerning its therapeutic action is that it is not a proper substance to mix with food."

One of the best books on hygiene existing is the work, *Preventive Medicine and Hygiene,* by Dr. Milton J. Rosenau (Appleton & Co., 1921). We read on page 741 of that standard work:—

"Foods exposed to a smouldering wood fire become impregnated with pyroligneous acid, which includes creosote, acetic acid, and probably formaldehyde and other substances having antiseptic properties. This method of food preservation is not only countenanced by the law, but is favoured on account of the savoury result and the antiquity of this 'natural' process. . . .

"No sweeping generalization can be made concerning all chemical preservatives. Each subject must be considered for itself, and each subject must further be considered in relation to the particular foodstuff for which it is proposed. It may, however, be stated as a general rule that any chemical which is poisonous in large amounts should be considered as poisonous in small amounts until the contrary is proved. In other words, the consumer is entitled to the benefit of the doubt. Toxicology of various food preservatives is in its infancy, and frequently presents a very difficult and complex problem."

According to Dr. Rosenau: "Any chemical which is poisonous in large amounts should be considered

poisonous in small amounts until the contrary is proved." This is undoubtedly the only safe rule. Many English experts share Dr. Rosenau's opinion. For instance, in his work on *Food Poisoning,* London, 1920, Dr. W. G. Savage tells us:—

"While these preservatives in the amounts found may not be harmful to normal men, they are likely to be detrimental to certain sections of the community, i.e. the delicate, diseased, or young. The cogency of this argument is augmented by the fact that, for most foods, the law does not require disclosure of the presence or amount of preservatives, and that it is therefore impossible to ensure or safeguard in any satisfactory way that such sensitive persons may not be dosed with these chemicals without their consent or knowledge. . . .

"The fact that our present knowledge may not be sufficient to allow the formulation of sufficient evidence as to harmfulness to be forthcoming, does not invalidate the possibility that their administration, especially over prolonged periods, may be a cause of ill-health. In other words, it is a fair line of argument to take that the addition to food of substances which are known poisons in large doses may exert a definite, if unknown, effect upon the tissues of the normal organism, and so be a cause of chronic disease, and that the public should not be exposed to these unknown, although problematical, risks without their knowledge and consent. . . .

"Most of these substances are admittedly poisons when administered in large doses, and therefore the controversy over their harmfulness ranges over the question of their administration in large doses. For example, for boric acid and its compounds there are a good many definite recorded cases of poisoning from their use in large amounts. . . ."

It might be thought that the various experts whose opinions have been given expressed merely a

personal and more or less instinctive prejudice against chemical preservatives. However, their views are based, not merely on logical reasoning, but on actual experience and on experiment. In the 6th Edition of the well-known work, *Hygiene and Public Health,* written by Drs. L. C. Parkes and H. R. Kenwood, London, 1917, we read on pages 370-2:—

"In recent years it has become the custom, especially in the summer months, to add a little formalin, or boracic acid, or borax to the milk as a preservative against fermentative changes. Whatever antiseptic was used, it was consumed with the milk by the customer, and adds another danger to the already long catalogue attributable to milk.

"This employment of agents, termed antiseptics, which will prevent the development of micro-organisms in food, is now prohibited in milk; but it is extensively practised in connection with other foods.

"The antiseptics most commonly employed in different kinds of food are borax and boracic acid, salicylates, benzoates, formic aldehyde (used as 'formalin,' a 40 per cent. solution of formic aldehyde), sodium chloride, and vinegar; but saltpetre, chloride of ammonium, sulphate of calcium, alum, spirits of wine, sulphurous acid, bisulphate of lime, and sulphate of copper, have all been employed.

"There is no doubt that the unrestricted use of these agents should be condemned; for though in the case of those most commonly employed their use has not been *proved* to cause any direct harm to consumers, it is a reasonable belief that the ignorant employment, even of such a substance as boracic acid, may effect slight and indirect injury to health, and is capable of seriously interfering with digestion. Dr. H. W. Wiley, of the United States Department of Agriculture, demonstrated in 1905-7, from feeding experiments upon twelve healthy young men,

that formic aldehyde, boric acid, and salicylic acid are substances which, when added to food, even in small quantities, may exercise a harmful effect on digestion and health. Few of these agents enter normally into the constitution of the human body; and at least they must be regarded as foreign bodies whose ingestion works no possible good, and which, not being foods, do not in any way make amends for the additional work of elimination which their presence demands. Moreover, they enable vendors or manufacturers to deal with stale or badly prepared food, to the prejudice of the more honest tradesman. If the adulteration is permitted, the vendor should at least be compelled to state the nature and amount of preservative employed.

"Opinion is somewhat divided as to the actual harm which results from the use of very small quantities of preservatives in food, but the use of such agents is unnecessary; and it is certain that even so rapidly decomposable a food as milk, when collected and stored with proper regard to cleanliness, and quickly chilled, can be sufficiently preserved, even in the hottest weather, to meet all the requirements of its distribution and use. Food purveyors have very little knowledge as to the amount of preservative it is necessary to add, and there is nothing to prevent such an article as milk from being dosed more than once; moreover, an injurious quantity of preservative may easily be consumed in a meal which includes a number of foods, in each of which there is only a small quantity of preservative. The practice of using preservatives in food also leads to uncleanly treatment, and is often the means employed to render unwholesome food saleable.

"It is possible that the 'epidemic eczema or dermatitis,' which has been observed of recent years in various metropolitan poor-law infirmaries, and which, attacking principally inmates of advanced age, caused in some outbreaks the deaths of 10 per cent. of those attacked, is due to the consumption of milk containing formalin, and possibly other preservatives.

"The Departmental Committee appointed to enquire into the use of preservatives and colouring matters in food in the year 1899, recommended the prohibition of the use of formic aldehyde and that salicylic acid should not be used in greater proportion than 1 grain per pint in liquid food, and 1 grain per pound in solid food. The use of any preservative and colouring agents in milk was condemned.

"They found that no preservatives should be used in any invalid or infant food. . . .

"Experiments have shown that boric acid in the proportion 20 grains to the pound prevents objective decomposition, such as is detected by smell, without affecting the growth of coli organisms or Gaertner's bacillus. Its employment may therefore cloak the use of stale meat in sausages without removing or reducing the possibly harmful results of its consumption."

The authors tell us that feeding experiments made upon twelve healthy young men have shown that even small quantities of the chemical preservative most generally used "may exercise a most harmful effect on digestion and health," and that they enable tradesmen to palm off "stale or badly prepared food" upon the unsuspecting public. Moreover, they tell us that, in certain charitable institutions, epidemics of eczema or dermatitis, followed by death of 10 per cent. of those attacked, were "due to the consumption of milk containing formalin, and possibly other preservatives."

Having listened to the views on chemical preservatives expressed by some of the best-known experts, let us briefly consider the position with regard to chemical colouring matters supplied to foodstuffs. Dr. W. G. Savage wrote on pages 38

and 39 of his valuable work, *Food and Public Health*, London, 1919:—

"Several generations ago a good many foods were adulterated with colouring matters distinctly harmful in character. Examples are various salts of iron, red lead and chromate of lead, sulphate of mercury, coloured salts of arsenic, etc. The use of such deleterious substances has practically ceased, partly owing to a recognition of their harmfulness, but also because the introduction of aniline dyes rendered their use unnecessary. Practically all those added at the present day (apart from salts of copper) are vegetable or aniline dyes which, so far as is known, are harmless. Annatto is the most extensively used of the vegetable dyes, and is still the principal substance used to dye butter, milk, and dairy products generally. It is also added to margarine. Turmeric is another vegetable stain sometimes employed. There is no evidence that either of them is harmful. A very wide range of aniline dyes is used, and very many foods are so coloured. . . .

"The only one of these dyes which may be distinctly harmful is salts of copper, added to peas and other vegetables to give them a good colour. There is still some controversy as to whether this addition has given rise to ill-health, but the latest expert information, as contained in the special Report issued by the U. S. A. Board of Agriculture, is to the effect that it may do so even in the small amounts which may be used. Copper salts may also have the effect of concealing inferiority, inasmuch as the bright green colour imparted to the vegetables simulates a state of freshness they may not have possessed before treatment."

Dyes applied to foodstuffs are pronounced by Dr. Savage to be "so far as is known harmless" if they are vegetable or aniline dyes. As aniline in certain forms is highly poisonous, and as workers employed in dye-works are very apt to contract a special kind

of cancer, bladder cancer, which is sometimes called "aniline workers' cancer," the public have every reason to object to the absolutely unnecessary, and possibly very dangerous, dyeing of foodstuffs with aniline dyes. Why should we be compelled to consume dyes even with our milk and butter? Even the most eminent scientists find it occasionally necessary to revise their most emphatic pronouncements. However, Dr. Savage agrees with all other food chemists in condemning the use of copper salts with which stale bottled vegetables are given the appearance of freshness. It is worth noting that pastries and cheap sweets are frequently gaudily coloured with aniline dyes. Possibly the dyes used may do very serious harm to the children who consume them.

Many authorities might be quoted in confirmation of the assertion that both preservatives and colouring matters are very undesirable, and are frequently injurious to health. We read, for instance, in the article "Food," printed in the *Encyclopædia Medica,* 1917, under the heading, "Preservatives and Colouring Matters":—

"Whilst the chemical used may check putrefactive changes in the foods, it may also check the fermentative processes of digestion.

"The preservatives most commonly in use are boracic acid or borates, salicylic acid or salicylates, formalin, and, of course, salt. Boracic acid, or borates, is very largely used; margarine, butter, ham, bacon, sometimes fish, cream and milk, contain it; in margarine and butter it is more or less uniformly mixed, its use has been common for many

years, 30 grains to the pound being often met with; in hams and bacon it is usually on the outside, although not infrequently from 4 to 8 grains per pound are found in the interior. Sausages, pork pies, and pastry frequently contain it. Salicylic acid and salicylates are found in jam, but the manufacturers appear to be *bona fide* anxious to add only the necessary minimum in this case; what are known as British wines, and also certain temperance drinks, are frequently found to contain boracic acid far in excess of what is necessary, the range found being from 4 to 100 grains of boracic acid per gallon and 7 to 150 grains of salicylic acid per gallon. Their use in these larger quantities is definitely objectionable. It has actually been urged in defence of the practice that the quantities are not larger than those given in medicinal doses; that may be true, but the question is one, not of medicine, which may be all very well in its way, but of food, and indiscriminate doses of physic are not wanted at meal-times.

"Formalin is not infrequently used to preserve milk and cream. The addition of chemical preservatives of various kinds to milk is commonest during the winter months, perhaps because at that season the milk has the highest value, and consequently the greatest profit is to be derived from keeping it, so that it may be worth the dealer's while to run the risk of a prosecution.

"The pernicious results arising from the indiscriminate use of preservatives have been demonstrated by Professor Boyce, who fed three series of five kittens upon milk containing (*a*) 10 grains of boracic acid to the pint, (*b*) 5 grains of boracic acid to the pint, (*c*) upon pure milk, and found that the group fed with 10 grains to the pint became emaciated and died after obvious evidences of gastro-intestinal disturbances, and those treated with 5 grains showed similar results, while the remaining five continued perfectly healthy and showed the normal increase in weight.

"Similar experiments with formalin showed, in proportion to the quantity of the formalin used, ill-health and

emaciation, whilst control kittens fed with pure milk remained active and well and increased in weight.

"Enquiry shows clearly enough that grave danger will follow if young infants are fed upon milk containing these preservatives, and it emphasizes the necessity for feeding infants as Nature intended them to be fed, or, if that is impracticable, to employ only pure, natural, and clean substitutes."

I would draw particular attention to the fact that, according to the *Encyclopædia Medica,* the chemicals used for checking putrefaction may also check the fermentative processes of digestion.

It will be noticed that of a number of kittens fed upon milk containing 10 grains of boracic acid to the pint became subject to gastro-intestinal disturbances and died, that milk containing half the quantity of boracic acid showed similar results in the test animals, and that experiments made with milk containing formalin led to ill-health and emaciation. We cannot wonder that the article concludes that "grave danger will follow if young infants are fed upon milk containing these preservatives."

The preservative most widely used is borax. We are often assured by interested parties that a small addition of that substance is "quite harmless." Some brief references to that preservative have been given previously in the various expert opinions quoted. In the excellent work, *Preservatives in Food Contamination,* by Drs. Thresh and Porter, London, 1906, we read on page 41 the following description of the effect of borax upon the human system:—

"Dr. Tubb Thomas administered boric acid to himself up to 15 grains a day, with the result that vomiting, diarrhœa, headache, and almost complete suppression of urine took place. . . .

"Dr. J. H. Jones stated that a delicate lady was suffering from dyspepsia; the milk and butter were examined and found to contain boric acid (to the extent of 1.3 per cent. in the case of the butter). The symptoms disappeared when a pure supply was obtained.

"Dr. Tubb Thomas related instances of children suffering from diarrhœa, not occurring entirely in the summer, to whom he gave small doses of boric acid; instead of recovering they became worse, and some of them died. It was found that the milk they were taking contained from 40 to 120 grains of boric acid per gallon. Children in similar circumstances, but having different milk supplies, escaped. He had also met with cases of phthisis in which the patients had had to give up milk on account of the diarrhœa it caused. The milk was found to contain boric acid. When a fresh supply of milk was obtained, the patients were able to take it without ill-effects.

"Probably the most striking instance of the ill-effects producible by boracic acid was furnished by Dr. E. Hope. A lady had made arrangements with her milkman to supply pure milk for the use of her child. Expense was no object, and all the cows were examined by a veterinary surgeon. The child was taken violently ill one day, and it was ascertained that on that particular occasion the milkman had added boracic acid to the milk. Careful enquiries were made as to the possibility of the illness being due to any article of food, but everything indicated the milk as the cause. The fact that a preservative had been added on that day is, however, suggestive of the milk not being the same as that usually supplied, or of its having shown signs of undergoing some change. However, Dr. Hope was strongly of opinion that the preservative was the cause of the illness.

"A far more serious aspect of the case is the alleged effect of borax and boracic acid on the kidneys. In 1901, Dr. Kister, of Berlin, published the results of his observations on the administration of boracic acid to strong and healthy subjects. He found that doses of 40 to 50 grains a day produce albuminuria in 4 to 6 days, the albumen persisting until the drug was discontinued. In some instances he found that a dose of 15 grains resulted in vomiting and diarrhœa. With a 15-grain dose, given to a healthy subject, boracic acid appeared in the urine in 2 hours, but 8 days elapsed before the whole was eliminated. . . . Dr. Charles Harrington conducted a series of experiments on cats, feeding 1 on food containing no preservative, 6 on similar food containing borax, and 5 on the same food containing some other preservative which proved to be innocuous. . . .

"Three of the above 6 cats became ill. No. 3 died at the end of the sixth week, but the others remained active till the end of the experiments. The 11 remaining cats were killed. The organs of the 6 cats which had not received borax were healthy. In the case of those to which borax had been administered, the kidneys were, in all except No. 2, found to be affected with nephritis of varying degrees of intensity. The epithelium of the tubes, especially the convoluted tubules, was degenerated, and in the lumen of many of the collecting tubules there were granular masses of fragments of cells. Some tubules were almost entirely destroyed. This is fairly conclusive evidence that excessive amounts of borax are harmful, but it does not follow that, because 0.54 to 0.85 gramme (8 to 13 grains) administered daily to a cat causes nephritis, the same amount taken by a healthy adult would have the same effect. The difference in body weight is very considerable, and the human kidneys may possess greater powers of elimination than those of the cat. Still, taken in conjunction with Dr. Kister's observations, there is little doubt that doses of 40 to 50 grains per day are not without effect upon the human kidney."

From the very interesting account given, it appears that the consumption of boric acid is apt to lead to dyspepsia, vomiting and diarrhœa and to violent illness, and that it is also apt to lead to the degeneration of the kidneys.

In order to convince readers that the consumption of borax may lead not only to dyspepsia, vomiting, diarrhœa, and violent illness, but to death, I would quote the following case of borax poisoning reported in the *Journal of the American Medical Association,* vol. 76, page 378, of 1921:—

"On account of the discussion between pure food experts and manufacturing concerns regarding the toxicology of borax, the case herewith reported is important from a pharmacologic and economic standpoint.

"Mr. K., aged 66, a painter, who had formerly been in excellent health, felt slightly constipated, and at 8 a.m. took from a marked bottle about an ounce of what he thought was a proprietary saline cathartic. Within 15 minutes he was seized with violent epigastric cramps, accompanied by attacks of retching and vomiting coming on at from 5 to 10 minutes' intervals. A physician was called, who made a diagnosis of acute indigestion and ordered milk of magnesia. At 10.15 I was hurriedly called. When I arrived, the patient's pulse was weak, the extremities were cold and clammy, there was a cold sweat on the forehead, and cyanosis. At 5 minutes' intervals he would cry out that he was strangled or choking, and he almost strangled when a little whisky was administered. The lips were slightly cyanotic. At intervals of a few minutes he cried out with pain in the epigastrium, and then immediately after he would grasp his throat and complain of difficulty in swallowing, of choking and strangling. Notwithstanding active, hypodermic stimulation (1/20th grain

of strychnine and 2 c.c. of camphor in oil), he died in one of these paroxysms one hour after my arrival. There was no lead line on the gums or other symptoms present or past to suggest lead colic.

"Necropsy was advised and permitted by the family. The bottle, half filled with the powder taken by Mr. K., was saved. Necropsy, performed at 4 p.m. by my associate, Dr. L. H. Fuson, revealed nothing abnormal. Chemical analysis of the contents of the stomach demonstrated the presence of 1½ oz. of borax. The bottle contained pure borax. . . . This case demonstrated that borax is a patent poison when taken in large quantities. It should be labelled poison, and should not be used carelessly without a definite understanding that it has fixed toxicologic properties."

A poisonous substance which is apt to cause death within three hours, if taken in a large dose, may not safely be taken in small doses day by day. That seems indisputable.

On page 369 of the *Lancet* of 1907 we read the following:—

"Note on the Effects of Borax on Infants.

"By James Charles McWalter, M.D. Brux., L.R.C.S. Ire., D.P.H.

"The question of the propriety of employing borax or other compounds as a preservative for milk or other foods is one which cannot be decided by the mere *obiter dicta* of the medical man. Powerful commercial influences are concerned in the use of preservatives in food, and it is not sufficient for a medical man absolutely to condemn the practice if he finds himself in the witness-box under the examination of an able King's Counsel. This gentleman will doubtless demand specific instances of the harmful

effects, either from the witness's experiences or from credible works. These instances seem to be particularly scanty in British journals, although Dr. Wiley has done a lot of work on the subject in America. I wish, then, to record a case of chronic borax poisoning which is just now under my care, and which seems as conclusive of the evil effects of the drug as a single instance can possibly be, for in this case the mother suckled the infant all the time and gave it no other nourishment.

"The infant was two months old when I saw it, and had been born a strong, healthy child. A fortnight after birth it developed thrush, for which borax and honey were applied. The child seemed to be relieved of the thrush by this remedy, and developed such a liking for it that it was applied most liberally—from two to three 4-drachm boxes having been used every week from the second to the eighth week. During this time a progressive wasting had set in, and when I saw the infant there was a marked erythematous eruption on the palmar aspects of the hands and on the plantar aspect of the feet, with distinct desquamation between the toes and the fingers; well-marked urticarial eruption was present in the arms and forearms, but the region between the legs was notably free from eruption. There were tumefaction and tenderness of the abdomen and a raw, pinky redness of the lips, tongue, palate, and throat, with vomiting and looseness of the bowels. The face had a wizened look, the skin was soft and brownish, the eyes were bright, and the joints, especially the knees, tender, swollen, and somewhat stiff. There was no evidence of syphilis or other cause for the wasting and rash, except the borax, of which the child had about 10 grains every day for six weeks. On stopping the borax and confining the infant to the breast-milk, together with a little raw beef juice, it appears to be recovering rapidly."

For every single case of chronic borax poisoning which gets into the paper, there may be hundreds

which are treated as "ordinary indigestion" and the like, and for every single case of death from borax poisoning of which we hear, there may be hundreds of deaths of infants due to borax which are erroneously ascribed to "colic" and various other causes.

The manufacturers and distributors who add borax to the food they sell claim, as a rule, that that drug destroys micro-organisms, that consequently the use of the drug is positively beneficial. That assertion is not in accordance with fact. According to the 6th Edition of the handbook, *Hygiene and Public Health,* by Drs. Parkes and Kenwood, London, 1917, page 361, borax, while allowing unscrupulous dealers to sell, as apparently fresh, food which is "in a state of incipient decomposition," does not "materially reduce the risk of poisoning from organisms of the Gaertner group or from Bacillus botulinus." We read on the page mentioned:—

"Boric acid is often used as a preservative. It is certain that, since boric acid prevents objective decomposition, such as is detectable by odour, it permits of the use of stale meat and meat in the early stages of decomposition for the making of sausages. While the amounts of boric acid usually employed will not enable the use of meat which has reached a stage of marked putrefaction, they permit the use of stale material in a state of incipient decomposition, and while they may reduce the danger from putrefactive toxins, they do not materially reduce the risk of poisoning from organisms of the Gaertner group or from Bacillus botulinus."

Dr. W. G. Savage tells us emphaticaly on pages 34-6 of his work, *Food and Public Health,* London,

1919, that "substances which are known poisons in large doses may exert a definite, if unknown, deleterious action upon the body when taken in small doses over long periods." We read:—

"It is to the addition of certain more recently discovered chemical substances, specially added as preservatives to prevent bacterial decomposition, that so great objection has been taken, and which is so much a question of controversy. The best known of these preservatives are boric acid and its compounds (including borax), salicylic acid and its salts, sulphites, formaldehyde, and benzoic acid and its salts.

"There is no dispute that all these newer substances added as preservatives are harmful to man in large doses, but those who justify their addition do so on the ground that their harmfulness in the small quantities in which they are added to foods under actual practical conditions has never been proved. . . .

"It is a fair line of argument to take, that the addition to food of substances which are known poisons in large doses may exert a definite, if unknown, deleterious action upon the body when taken in small doses over long periods, and that the public should not be subjected to this risk, even if problematical, without their knowledge and consent. Of the harmfulness of these substances in large doses there is no doubt, and since their addition is often in the hands of people quite ignorant of the niceties of chemical dosage, it frequently occurs that very much larger quantities are added than are necessary. For example, the writer once found the enormous amount of 96 grains of boric acid per pound in brawn, and the brawn-maker's excuse was that, as it was rather hot weather, he took a small handful and mixed it in. He evidently thought it could be used like common salt. . . .

"The present legal, scientific, and administrative positions are alike unsatisfactory. Except for preserved cream,

in which small declared amounts of boric acid are permitted, and for milk, to which their addition is prohibited, there are no legal enactments directly permitting or penalizing the addition of chemicals to food. This presses very hardly upon all sections of the community. The general public are, all unwittingly, obliged to consume a considerable proportion of their food mixed with chemicals which may be harmful, and as they do not know if they are there or not, they cannot decline to buy such food."

In the United States the reckless use of borax as a preservative is not permitted, and Americans can afford to smile at England's blindness in allowing the people in general, and the babies, small children, and invalids in particular, to be poisoned by daily doses of borax from which there is apparently no escape. In the *Journal of the American Medical Association,* vol. 80 (1923), we read on page 1317:—

"*Borax as a Food Preservative.*—A medical officer of a London suburb recently reported that some sponge-cake sold in a local bakery had been found to contain more than 35 grains of boric acid to each pound of cake. Investigation showed that the source of the boric acid was the liquid eggs (that is, egg-yolk and albumin, without the shells), shipped from China and resconstituted in England, used in the manufacture of the sponge cake. The liquid egg trade in England is said to amount to nearly $10,000,000 annually.

"Practically no liquid egg yolk containing boric acid comes into the United States, except such as is to be used for technical purposes, such as the tanning of leather. In such instances the Federal authorities require the material to be so denatured that it cannot possibly be used for food purposes. Liquid eggs containing boric acid are refused entry into the United States on the ground that they are

adulterated within the meaning of the Food and Drugs Act. The case reported from London well illustrates what happens when the bars are let down to chemical preservatives."

I have considered the position of borax very fully because it is the preservative most widely used.

Among the well-known poisons, apart from preservatives, which civilized men are apt to consume in their food, are lead, a very deadly substance, and tin. Dr. W. G. Savage wrote on page 27 of his work, *Food and the Public Health,* London, 1919:—

"Lead is a metal which is found in many foods and may be derived from very diverse sources. For example, some of the enamels used for glazing earthenware contain lead, and may give it up to the foods put into such vessels; tea is wrapped in lead foil, wine bottles are sometimes cleaned by shaking lead shot into them, soda-water siphons are fitted with valves containing lead, and cider may be heavily contaminated with lead from vessels used in the course of its manufacture. . . ."

Evidently we are liable to absorb the deadly lead unwittingly from a great many sources. The danger of lead, even in infinitesimally small quantities, is described as follows on page 635 of Dr. A. Wynter Blyth's excellent work, *Poisons: Their Effects and Detection* (C. Griffin & Co., Ltd., 1920):—

"The Departmental Committee appointed to enquire into the white lead and allied industries, in a report presented to the Home Secretary, stated:

"8. (*a*) It is known that if lead (in any form), even in what may be called infinitesimal quantities, gains entrance into the system for a lengthened period, by such channels

as the stomach, by swallowing lead dust in the saliva, or through the medium of food or drink; by the respiration organs, as by the inhalation of dust, or through the skin, there is developed a series of symptoms, the most frequent of which is colic. Nearly all the individuals engaged in factories where lead or its compounds are manipulated look pale, and it is this bloodlessness and the presence of a blue line along the margin of the gums, close to the teeth, that herald the other symptoms of plumbism.

"(*b*) A form of paralysis known as 'wrist-drop' or 'lead palsy' occasionally affects the hands of the operatives. There is, in addition, a form of acute lead poisoning, most frequently met with in young girls from 18 to 24 years of age, which is suddenly developed and is extremely fatal. In it the first complaint is headache, followed sooner or later by convulsions and unconsciousness. Death often terminates such a case within three days. In some cases of recovery from convulsions, total blindness remains.

"9. There has been considerable doubt as to the channels by which the poison enters the system. The Committee have taken much evidence on this subject, and have arrived at the conclusion (*a*) that carbonate of lead may be absorbed through the pores of the skin, and that the chance of this is much increased during perspiration and where there is any friction between the skin and the clothing; (*b*) that minute portions of lead are carried by the hands, under and round the nails, etc., on to the food, and so into the stomach; (*c*) but that the most usual manner is by the inhalation of lead dust. Some of this becomes dissolved in the alkaline secretions of the mouth and is swallowed by the saliva, thus finding its way to the stomach. Other particles of dust are carried to the lungs, where they are rendered soluble and absorbed by the blood. (Report of the Chief Inspector of Factories for 1893.)"

Ever-increasing quantities of food reach us from the great canneries in tinned receptacles. The tin

which prevents the iron corroding is apt to dissolve. Hence many people are absorbing not inconsiderable quantities of tin to their danger. Dr. W. G. Savage, in his book *Food Poisoning,* previously mentioned, has told us with regard to tin:—

"Tin may exert a toxic action in two different ways. The amount taken into the body with the food may be so considerable that a single dose may set up acute symptoms, or chronic poisoning may be induced by much smaller quantities taken over a long period. . . . Irritant poisoning has been produced in adults who have taken at a single meal a quantity of tin equal to 2 grains or thereabouts. It will also be noticed that in some of these cases the dose has apparently been taken in a small bulk of food, in circumstances which suggest that the proportion of tin present in the food which caused the mischief was rather of the order found in canned foods which owe their metallic contamination to escape of solder than of the kind which may be present in well-soldered tins that are merely 'old.' At the same time, it must be remembered that it is only the severe cases that are at all likely to receive investigation and record, and it is impossible to ignore the probability that taking at a single sitting food which contained the equivalent of 2 grains of tin (or even an amount materially less than 2 grains) would result in gastro-intestinal disturbance, where the tin was concentrated in a small bulk of food, or present in a larger mass. . . ."

With regard to copper sulphate, which is frequently added to preserved vegetables, giving them a beautiful green colour, the same author stated in the book mentioned:—

"This substance is chiefly used in the greening of vegetables. The Departmental Committee remarks: 'It is highly

undesirable that what is admittedly a poisonous substance should be used, even to the smallest extent, in connection with such food as may be consumed in considerable quantity. Direct proof that vegetables containing copper are injurious to the consumer is, from the very nature of the case, difficult to obtain, and we must admit that we have not succeeded in obtaining it. There is evidence pointing to the conclusion that the copper, when added to the vegetables, forms a compound which is not easily soluble in the human economy. There is, however, evidence of a contrary character, and it is not clear to us that the whole of the copper added becomes, or remains, insoluble under all conditions. Be this as it may, recent events have so incontestably demonstrated the serious and widespread mischief which may result from the consumption of food and drink, other than sweetmeats, containing even minimal quantities of poisonous metallic substances, that we are strongly of opinion that such poisonous substances should be rigorously excluded. . . .' ''

In addition to borax and the various other chemical preservatives which modern civilization causes us to consume day by day, year in and year out, we are absorbing from containers and from other sources not inconsiderable quantities of metallic poisons which are not preservatives, such as lead, tin, and copper sulphate.

In Chapters VI and X it has been shown that arsenic is undoubtedly a very serious cancer-producer. Arsenic, as was previously stated in this chapter, is found in conjunction with many minerals, and it is apt to insinuate itself into food and drink of every kind. Every now and then we read of outbreaks of acute arsenic poisoning, the poison turning up unexpectedly in beer, in chocolates and

confectionery, in cocoa, and so forth. Dr. W. G. Savage wrote on pages 24 to 27 of his book, *Food and the Public Health,* London, 1919:—

"Arsenical compounds are widely diffused in nature, and quite minute traces are not uncommon in many foods and substances used for the preparation of food. It was not until the extensive and widespread outbreak of arsenical poisoning in 1900 directed attention to the subject that the danger of arsenic in food was realized and adequately studied. . . .

"During the latter part of 1900 a very extensive outbreak of sickness, involving well over 6,000 persons, with more than 70 deaths, attributable to poisoning by arsenic, occurred in England and Wales. The very careful enquiries made showed that the outbreak was due to beer contaminated with arsenic. In every case this beer was supplied from breweries which made use of brewing sugars (i.e. glucose and invert sugar) supplied from a single source. These sugars are extensively used instead of, or as additions to, the malt sugar obtained from grain fermentation. As much as ½ to 9 grains of arsenic per pound were found in these different sugars. In their preparation sulphuric acid is used, and the arsenic was derived from the acid, which was found to be heavily contaminated with arsenic (from 1.4 to 2.6 per cent.).

"It was found that the beer, as consumed, contained from ¼ to 1 grain of arsenic per gallon, while in exceptional cases much larger amounts were detected. These are large quantities for this substance, the medicinal dose of arsenic being 1/60 to 1/12 grain expressed as the oxide. . . .

"Arsenic may gain access to various foods. Thus it has been found in sweets when glucose contaminated with arsenic was used instead of cane sugar. An extensive outbreak of 62 cases of arsenical poisoning occurred in Manchester in 1908 from sweets contaminated in this way.

"Arsenic has been found in cheap confectionery, derived

from shellac used to coat the confectionery. It may be deposited on the surface of fruit treated with insecticides containing arsenic. Recently it has been found in a considerable number of samples of baking powder substitute in this country. The substitute contained acid calcium phosphate instead of cream of tartar, and in this were found substantial amounts of arsenic. Here, again, the actual sources of the arsenic were from sulphuric acid used to prepare the acid calcium phosphate.

"Arsenic is so powerful a poison that no arsenic should be tolerated in food. The Royal Commission on the subject reported they 'are not prepared to allow that it would be right to declare that any quantity of arsenic, however small, is admissible in beer or in any food.' "

The same author wrote on pages 191 and 192 of his book, *Food Poisoning,* London, 1920, quoting the English Royal Commission:—

"The Commissioners consider that the exclusion of small quantities of arsenic from food and drink is of greater importance than might at first sight be supposed. Clinically, the fact of quite small quantities of arsenic administered over long periods with food cannot be said to have been fully studied; evidence of marked toxicity may be absent, but yet the arsenic may have unrecognized effects upon nutrition. They add: 'It would be unwise to express an opinion that any quantity of arsenic, however small, is to be regarded as admissible in any article of food, and we think it should be the aim of the food manufacturer to exclude arsenic altogether from his products.' . . .

"The modern spraying of fruits and vegetables with insecticide solutions is another possible source of arsenic and other metals. Arsenic is an ingredient of many insecticide solutions, and may gain access to food from this source with want of care. MacFadden (1913-14), for instance, mentions that during 1914 a consignment of apples from

the United States had on their skins a bluish deposit, evidently the remains of an insecticide wash. Analysis showed that copper in small quantities and arsenic in traces were present in this deposit.

"This subject has recently been investigated by the New Hampshire, U.S.A., Agricultural Experiment Station (1917), in regard to the use of lead arsenate solution. This report shows that in the case of apples the maximum amount of the poison that may be expected to occur on the fruit would not exceed 0.5 mgm. per apple. In the case of small fruit, the possibility of danger is greater, and half a pound of strawberries may carry as much as 8 mgm. of oxide of arsenic. Such a dose, while insufficient to cause symptoms in an adult in the ordinary way, might affect enfeebled adults or children. In the same way, green vegetables, such as cabbages or lettuce, may be infected and carry a relatively large amount of poison.

"Recently arsenic has been found in a considerable number of samples of baking powder substitute (MacFadden, 1916)."

I have shown by an overwhelming amount of evidence that the chemical preservatives and colouring matters currently used by modern nations are very undesirable and are distinctly dangerous, that they involve the possibility of chronic and acute poisoning, that probably the number of deaths and the number of illnesses following poisoning by the preservatives habitually used, by the metallic poisons mentioned and by arsenic, is enormously greater than the relatively small number which is brought to public notice. I have also shown by an overwhelming quantity of evidence, given in Chapters VI, VII, and X, that cancer is caused in innumerable instances through chronic poisoning due either to

the ordinary poisons, such as arsenic, aniline, etc., which easily prove fatal if absorbed in appreciable quantities, or to the absorption of self-distilled poisons, by auto-intoxication, when the individual has absorbed bowel poisons during a long number of years. In many cases, absorption of poisons during 10, 20, 30, or more years has preceded a cancer outbreak which was obviously due to chronic poisoning in one form or the other.

During the last two or three decades the number of poisons which, if absorbed in exceedingly minute doses during a prolonged space of time, are apt to result in cancer, has rapidly increased. The list of cancer poisons cannot possibly be considered as being finally closed. With the advance of knowledge, we may probably find that a great many other poisonous substances have upon the human body effects similar to those of the known cancer-producers. There is, therefore, every reason to suspect very gravely all poisonous preservatives, colouring matters, etc., and particularly, of course, known cancer-raisers such as arsenic. Those engaged in cancer research and the public authorities should make every effort to find out whether the irritant poisons with which we are dosed every day against our will may, or may not, be one of the causes of cancer. It seems quite possible, indeed very possible and probable, that the various poisons mentioned in this chapter, or at least some of them, should prove the direct cause of that horrible disease.

It has been shown in the concluding portion of the second chapter that, according to authoritative

opinion, "cancer never attacks a healthy organ or a healthy tissue." If we wish to protect ourselves against cancer, we must maintain our bodies in health, for the healthy body offers the most energetic resistance, not only to cancer, but to all disease-causing factors. That fact is now generally admitted. By absorbing day by day and week by week poisonous and injurious preservatives, we weaken our bodies and we lame our power of resistance to disease. The poisonous preservatives with which we are dosed year in and year out do us undoubtedly great injury either by acting directly as cancer-producers, or indirectly by weakening us and thus opening the door to cancer and to other diseases. I think readers will be convinced, by the vast and authoritative array of opinions given, that the poisonous chemical preservatives generally used must be considered to be either a direct cause or a very potent contributory cause of the most terrible of all maladies.

In Chapter IX the importance of vitamines was considered. It was shown in that chapter that vitamine starvation leads to the degeneration and the ulceration of the stomach and bowels, and in Chapter VII a vast amount of evidence has been supplied showing that ulcers of the stomach very frequently prove the seats of cancer. In the next chapter it will be shown that lack of vitamines is exceedingly harmful, not only in causing the degeneration and laceration of the alimentary tract, but also in undermining our general health. Preserved food is devitalized food, is food deprived of the precious

vitamines. Herein lies an additional reason for our shunning the preserved foods with which we are being plied to an ever greater extent, for they are deprived of vitamines, as a rule.

Chemically preserved foods are undesirable and dangerous because they rob us of the indispensable vitamines and replace them by dangerous poisons. However, there is an additional reason why preservatives in food should be avoided. Interested persons and others tell us that the use of these chemical drugs is "beneficial" inasmuch as they destroy harmful organisms. However, it is by no means impossible that these preservatives have very unfortunate effects which are only beginning to be suspected.

Dr. Roger I. Lee, Professor of Hygiene in Harvard University, wrote on page 163 of his excellent book, *Health and Disease: Their Determining Factors,* Boston, 1917:—

"At first thought it might seem possible to kill all the pathogenic bacteria wherever they exist. But it must be remembered that the non-pathogenic bacteria are necessary for life, and that we cannot always distinguish definitely between pathogenic and non-pathogenic bacteria. . . .

"Bacteria must be regarded as a form of life, and the use of disinfectants which kill bacterial life will also destroy other kinds of life. The use of disinfectants will, for instance, tend to kill the cells of the hands, while it is almost impossible to use disinfectants in the throat without killing the cells of some of the delicate membranes. But, in their place, disinfectants play an important and necessary rôle."

The high French authority, Dr. A. Satre, as reported in the *Journal of the American Medical Association,* vol. 69 (1917), page 1476, stated:—

"The substances added to foods to prevent fermentation before they are eaten, prevent it also after they are eaten, so that the food is unable to be subjected to the normal digestive changes in the alimentary tract. The person thus suffers from defective digestion, while the liver and kidneys may be gradually affected by the minute doses of the preservative.

"The diagnosis is extremely difficult unless a whole group of persons eating the same food developed parallel dyspepsia, etc. Differential diagnosis may be difficult, even with such an easily suspected drug as arsenic ingested in minute amounts over long periods.

"The newborn, the elderly, and pregnant women are particularly sensitive. The infant gets salicylic acid in its breast-milk if the mother is getting salicylic acid as a preservative in some article of food. If brought up on the bottle, its digestive functioning may be upset by the preservatives added to the cow's milk, or sodium bicarbonate or other substance used in cleaning bottles.

"In the elderly, as the kidneys grow less permeable, the preservatives ingested in food are retained and pile up in the body. The kidney is also less permeable in the pregnant woman, and retained accumulating antiseptics have a directly injurious action on both herself and the fœtus."

In a lecture delivered at the Institute of Hygiene of London, and reported in the *Health Notes* of that body in January, 1924, Dr. James Fenton, Medical Officer of Health to the borough of Kensington, discussing preservatives and adulterants in food, stated:—

"In considering whether these drugs are dangerous to health or not, we must remember that they are added to foodstuffs for the purpose of preventing or arresting certain forms of decomposition, or of masking or hiding the evidence of commencing decomposition, which is a fermentative process. Digestion in the stomach is a process of fermentation too, and, in so far as these chemicals are capable of preventing or arresting decomposition in the foodstuff, so far may they also retard and injuriously affect the processes of digestion. These drugs, moreover, will kill bacteria, and therefore it is only reasonable to assume that they must be injurious to the highly organized and sensitive living cells which go together to make up the human body."

In the opinion of Dr. Satre, "the substances added to foods to prevent fermentation before they are eaten, prevent it also after they are eaten," and thus cause digestive troubles, while the liver and kidneys, the great eliminators of the body poisons, "may be gradually affected by the minute doses of the preservative."

Dr. Fenton also believes that the arrest of fermentation of foodstuffs before they are eaten will be followed by arrest of fermentation after they are eaten, and he concludes that chemical preservatives "must be injurious to the highly organized and sensitive living cells which go together to make up the human body."

The arguments of Drs. Satre and Fenton seem faultless. Decomposition is a natural process. It is arrested in the case of foodstuffs by chemicals, by a dope, which dopes the dead cells into inactivity. The same dope, when absorbed with the dead food

offered to us, may have a similar action upon the living cells of our body.

I think the facts and opinions collected in this chapter make it clear that chemical preservatives are most pernicious, that they act directly or indirectly as producers of cancer.

CHAPTER XII

The Defects of Modern Feeding and their Relation to Cancer—A General Survey, and How the Health of Infants and Children is Ruined

In the previous chapter of this book I have endeavoured to show that cancer is caused by chronic poisoning from without or from within extending over 10, 20, 30, or more years, and by vitamine starvation. I have endeavoured to show that the continued absorption of bowel poisons, chemical poisons, etc., leads to the degeneration of every tissue of the body and renders certain organs, the skin, and the mucous membrane liable to develop cancer. In Chapter III, I have shown by the testimony of a vast number of reliable witnesses that cancer is a disease of civilization, that it is practically unknown among primitive races which lead lives distinct from those of the Western nations.

At the beginning of the seventh chapter all the deaths from cancer which had occurred in England and Wales during the ten years 1911-20 were tabulated, and attention was drawn to the fact that in Great Britain, and in other countries as well, the majority of cancer deaths are due to cancer of some part of the alimentary tract. That is a most impor-

tant and a most significant fact which every reader should ponder upon, for it seems to indicate that there must be something very wrong in our system of feeding.

The *Annals of Surgery* published in June, 1914, a most interesting paper, "The Prophylaxis of Cancer," written by Dr. William J. Mayo, the great American surgeon. He stated:—

"Cancer of the stomach forms nearly one-third of all the cancers of the human body. So far as I know, this is not true of the lower animals, nor of uncivilized man. Trustworthy evidence on this point is, for obvious reasons, difficult to obtain. Why is there this extraordinary frequency of cancer in the stomach? Is the stomach a trap and the cancer parasite, if it be a parasite, strained out in the stomach? If that were true, why should not cancer of the stomach be as frequent in the lower animals as in man? In rats, cancer of the stomach is exceedingly common when the animals feed on cockroaches infested with nematodes, which cause a chronic irritation of the rat's gastric mucosa. Under other conditions it is very rare in these animals.

"Whenever cancer is found with great frequency in certain situations or in only one class of individuals, it appears to depend on a single cause; this is probably true of gastric cancer. Is it not possible, therefore, that there is something in the habits of civilized man, in the cooking or other preparation of his food, which acts to produce a pre-cancerous lesion? And it is probable that there is just one cause, since, if there were many causes, gastric cancer in man would have no such preponderance. Numerous factors would cause the development of cancer in other races and species equally exposed to their action. If we could but know what peculiar agency was responsible for the extraordinary frequency of cancer of the stomach, the

knowledge would play a great part in the prophylaxis of cancer."

Dr. Mayo's statement that cancer of the stomach "forms nearly one-third of the cancers of the human body, but, so far as I know, this is not true of the lower animals, nor of uncivilized man," is perfectly correct. Overwhelming evidence as to the rarity of cancer among primitive races has been given in the third chapter of this book. As regards "the lower animals," I would mention that cancer is very frequently seen in dogs, particularly in pampered house-dogs and lap-dogs. Dr. Jacob Wolff stated on pages 70 and 213, vol. 3, of his great book, *Die Lehre von der Krebskrankheit*:—

"Among 603 cases of cancer found in dogs were the following:

Breast	299
Skin	143
Anus	78
General cancer	39

"The dog, the most civilized of all the animals, is notorious for being subject to nearly all the tumours which afflict men, and in the case of dogs the percentage of malignant tumour is particularly high.

"According to Frohner's observations, cancer in dogs occurs as a rule in the outer skin. Although the author has worked with a material of 70,000 sick animals, he has never noticed cancer of the tongue or of the stomach, although cancer in these locations has occurred. Similarly, Casper has never found in animals, dogs included, a genuine cancer of the pharynx or the œsophagus. . . . While cancer in the upper portions of the digestive canal is extremely rare in the case of dogs, it is comparatively frequent in

the lower portion of the bowel, particularly about the anus. . . . Sarcoma of the jaws is frequent in dogs, where it usually starts from the gums. According to Wolff, horses and cattle suffer much less from cancer than dogs. Among the cases mentioned in the statistical tables given, there are none of cancer of the stomach."

According to Wolff, there are practically no cases of cancer of the stomach known with regard to cats and pigs.

There is obviously good reason for Dr. Mayo writing that there is "something in the habits of civilized man, in the cooking or other preparation of his food," which is responsible for cancer.

Apparently cancer of the stomach and the bowels is exceedingly rare in all animals. On page 89 of Mr. W. Roger Williams' excellent book, *The Natural History of Cancer,* London, 1908, we read:—

"The comparative rarity of gastro-intestinal types of cancer in animals is very marked: thus 1,312 cases of cancer in common domestic animals (horse, ox, dog, sheep, cat, and pig) as tabulated by Sticker (1,170 cases), Bashford, McFadyean, Cadiot, and Roger, comprise only 20 instances of malignant disease of the stomach, or about 1.5 per cent.; whereas, for human beings, the corresponding figure is about 17 per cent.; in like manner, the same series comprises only 42 cases of malignant disease of the liver, or 3.2 per cent.; whereas in mankind the corresponding percentage is about 13.5."

While Dr. Mayo tells us that cancer of the stomach forms "nearly one-third of all the cancers of the human body," other authorities give a much higher percentage. For instance, in the excellent work, *A*

System of Medicine, edited by Sir William Osler, Bt., London, 1915, we read on page 199:—

"*Cancer of the Stomach.*—About half of all cancers arise in the stomach, and statistics of hospital admissions show 47 per cent. of gastric cancers. Reiche's Hamburg statistics (1872 to 1895) show that 50.2 per cent. of all cancers are gastric, and that cancer of the intestinal tract, as a whole, forms 75 to 85 per cent. of all cancers. . . .

"*Sex.*—Of 20,000 cases collected from my combined statistics, 58 per cent. were in men. Welch gives the relation as 5 males to 4 females."

According to the book mentioned, half the cancer deaths and more are due to cancer of the stomach, and the proportion of men dying from cancer is very much greater than that of women. The reason for this difference will be made obvious in the following pages.

As the majority of cancers occur in the stomach and along the whole of the alimentary canal, the popular impression has arisen that "cancer has something to do with food." That surmise is on everybody's lips, and it is right to a large extent.

The state of the alimentary canal of civilized man, from its opening at the mouth to its exit at the anus, is a disgrace to civilization, is a disgrace to the medical profession, is a disgrace to modern science, is a disgrace to the food chemists, who are very largely to blame for it.

Weak and decayed teeth and septic gums infested with pyorrhœa are general. Stomachic indigestion is almost universal, and constipation, which is almost unknown among primitive races and among

animals, is practically universal. Sir T. Lauder Brunton, Consulting Physician to St. Bartholomew's Hospital, London, wrote in his article "Therapeutics," in the 11th Edition of the *Encyclopædia Britannica,* 1911: "Constipation is so common that it may almost be looked upon as the normal condition in civilized countries."

The universality, the "normality" of constipation among civilized races, is obviously due to wrong feeding, and, as the result of constipation which follows wrong feeding, our bodies get poisoned. More than half the diseases from which we suffer, among them cancer, would probably disappear if our digestive tract had not been completely ruined by our mistakes in feeding. That eminent medical man and investigator, Colonel Robert McCarrison, wrote in his book, *Studies in Deficiency Diseases,* London, 1921, an invaluable volume in which he described the most important experiments in vitamine starvation which he had made:—

"Vegetable margarines are replacing butter, even among the richer classes. Fresh fruit is a comparative rarity, even on the tables of the rich. Green vegetables are scanty, and such as there are, are often cooked to the point of almost complete extraction of their vitamine-content and salts. White bread has largely replaced wholemeal bread, and it is notorious that bread forms a high proportion of the dietaries of persons of limited means. . . .

"Infants fed on many of the proprietary foods in common use come within the category of the deficiently fed, unless deficiencies are made good. The food of young children is commonly low in vitamine-content and suitable protein, while it is frequently disproportionately rich in

starch and sugar, a circumstance which enhances the danger of vitamine deficiency. It may, indeed, be accepted as an axiom that the vitamine value of a child's food is reduced in proportion to its excessive richness in carbohydrates. But the ranks of the deficiently fed do not include only infants and young children; they include also those whose food is composed mainly of white bread, margarine, tea, sugar, and jam, with a minimum of meat, milk, eggs, and fresh vegetables. Even amongst those whose diet is more perfectly balanced, the commoner articles of food, as they are prepared for the table, are so low in vitamine value that, unless they are enriched with a sufficiency of natural foods in the raw state, they are bound to cause ill-health, and especially gastro-intestinal ill-health."

Dr. E. V. McCollum is one of the highest authorities on nutrition in the United States and throughout the world. He also has made experiments of the greatest importance, some of which are described in his book, *The Newer Knowledge of Nutrition,* New York, 1919. On page 148 of that book the author stated:—

"Liberal consumption of all of the essential constituents of a normal diet, prompt digestion and absorption, and prompt evacuation of the undigested residue from the intestines before extensive absorption of products of bacterial decomposition of proteins can take place, are the optimum conditions for the maintenance of vigour and the characteristics of youth. Such a dietary regime can be attained only by supplementing the seed products, tubers, roots, and meat, which must constitute the bulk of the diet of man, with the protective foods, milk and the leafy vegetables."

Violet G. Plimmer and Professor R. H. A. Plimmer, of London University and the St. Thomas's

Hospital Medical School, wrote on the opening page of their excellent book, *Vitamins and the Choice of Food,* London, 1922:—

"A sufficient quantity of good and suitable food is the body's first need. Proper housing, fresh air, and exercise play their part in maintaining health, but without good food they avail little. Famine, war, and poverty interfere at times with man's normal food-supply, and his health suffers. Far more serious is the daily use of improper food; it insidiously undermines the constitution. . . .

"Generally a variety of foodstuffs is available, and if the diet consists of a few well-chosen natural foods of both vegetable and animal origin, it will meet all the demands of the body. Under the conditions of modern civilization, a well-mixed and varied diet may be palatable and apparently sustaining, but if continued for a long time it may prove to be inadequate because it fails to supply everything that is wanted.

"A mixed diet of fresh meat, milk, butter, eggs, fruits, vegetables, and wholemeal bread, such as our grandparents ate, supplied all that is necessary, but this food is now largely replaced by canned meat, sterilized milk, margarine, egg substitutes; bottled, tinned, and dried fruits, vegetables and milk; white bread and other highly milled cereals. The effects of preservatives and refining processes has been to destroy what may be called the vital substances in the food substances, as important as the actual food material itself."

The child is father to the man. Faulty feeding is exceedingly harmful, not only to grown-up men and women, but even to the unborn babe and to the suckling. The value of a mother's milk depends upon the food she eats. Wise feeding, natural feeding, on the part of the mother, produces excellent

milk for the child, while unwise feeding, as now so frequently practised by mothers, weakens the child before it is born, and causes the milk of the mother to become not only insufficiently nourishing, but actually harmful to the suckling baby. Colonel McCarrison wrote on page 211 of his book previously mentioned:—

"When, as is sometimes the case, mother's milk is itself harmful to the child, is not this largely the result of her own disordered metabolism, in many cases resulting from improper feeding before, during, and after pregnancy? For mother's milk, like the milk of animals, may be deficient in certain respects if her food be deficient. The milk of stall-fed cows is not so rich either in Vitamine A or Vitamine C as that of cows fed in green pastures. Again, is not cow's milk—an important dietary constituent of young and old alike—gradually becoming a luxury reserved for the few?

"Vegetable margarines are replacing butter, even among the richer classes. Fresh fruit, certainly in Great Britain, is a comparative luxury, even on the tables of the rich. Green vegetables are scanty, and such as there are, are often cooked to the point of almost complete extraction of their vitamines and salts. White bread has largely replaced wholemeal bread, and it is notorious that bread forms a high proportion of the dietaries of persons of limited means. It is notable that, despite the food restrictions imposed upon the people of Belgium during the late war, the infant mortality and infantile diarrhœa decreased greatly—a circumstance which was due to the organized propaganda encouraging mothers to nurse their infants, and to the establishment of national canteens which provided prospective mothers from the fifth month of pregnancy onwards with eggs, meat, milk, and vegetables. Again, fresh eggs are so expensive as to debar the masses from their use.

Meat is at best but poor in vitamine, and its value in these essentials is not enhanced by freezing and thawing."

Dr. E. V. McCollum wrote on page 128 of his stimulating book, *The Newer Knowledge of Nutrition,* New York, 1919:—

"The statement which one sees reiterated so frequently that breast-feeding of infants is superior to the best system of artificial feeding needs to be qualified to some extent. There are, without question, in many parts of the world, large groups of people whose diets are of such a character that the quality of the milk produced by the lactating mother is not such as to make it a satisfactory food for their infants.

"It should be thoroughly appreciated that the human mother should have in her diet a liberal amount of milk in order to safeguard the health and well-being of her infant, and of leafy vegetables, which serve the twofold function of a protective food and of greatly aiding intestinal elimination. That some mothers can induce a fair amount of growth in their infants while taking a faulty diet, cannot be denied, but that both mother and child suffer impairment as the result is beyond question. It is not enough that the diet shall furnish enough calories and enough protein, and shall afford variety and palatability. The peculiar dietary properties of the foodstuffs which enter into diet are of paramount importance and must be taken into consideration.

"Attention should again be directed to the observations of Hess, that the diet of the negro women of the Columbus Hill district in New York, whose diets are derived almost exclusively from seed products, tubers, and meats, fail to nourish their infants satisfactorily, as shown by the almost universal prevalence of rickets among the latter."

The fact that breast-fed children will die like flies if the milk of their mothers is impoverished by un-

wise feeding may be seen by an example relating to the Philippines, described on pages 24-26 of the excellent book, *Vitamins and the Choice of Food,* by Violet G. Plimmer and Professor R. H. A. Plimmer, London, 1922. We read:—

"It is a peculiarity of the Philippine Islands that 75 per cent. of the infant deaths are amongst the breast-fed, chiefly from infantile beri-beri; in Europe, and practically everywhere else, this proportion is reversed, and the greater mortality is amongst the artificially fed infants.

"This disease in infants was first attributed to some poison in the mother's milk, but later it was proved to be the result of a deficiency of the anti-beri-beri substance in her milk, because her diet is poor in this substance. The natives believe that food is eaten merely to satisfy hunger, and not to supply material for flesh and blood; if they have no sensation of hunger, they think they are well fed, and are therefore perfectly content with their filling diet of white rice.

"Women with well-developed beri-beri seldom become pregnant; some whose diet is just on the border-line of deficiency conceive and produce plump and apparently well-nourished babies. The diet, just sufficient to maintain the woman before pregnancy, is inadequate for the needs of both mother and child, and beri-beri may develop in the mother during pregnancy or lactation. Her nursling becomes restless and sleepless, its face is usually very full, and there is a blue look round the mouth and nose; the plump limbs pit on pressure (œdema). The child appears out of breath; the voice alters and may be lost. Finally, the child dies from heart failure or convulsions. The right side of the heart is much dilated and displaced to the right as in adult beri-beri.

"The child's condition can be relieved only by a change of food. Artificial feeding is not practicable amongst these people because of their poverty and ignorance. Formerly

the only chance of saving the child's life was to transfer it to a healthy wet-nurse, but, since the recognition that the disease is caused by something lacking in the mother's milk, it has been possible to cure the child, while still suckled by the mother, by giving the infant an extract of rice polishings. . . .

"Andrews quotes the case of a young woman and her infant, both suffering from beri-beri, the mother so paralysed that she could not walk. In hospital the mother continued to suckle her baby, who received no other food, but the woman was given under-milled rice, instead of polished rice, and also some mongos, a kind of bean similar to the cow-pea of the United States. Both mother and child made a rapid recovery, and after only twenty days were discharged, cured."

In Western countries similar conditions are found. The unnatural diet adopted by mothers causes their breast-fed infants to sicken and to die, to suffer from constipation, diarrhœa, and to grow up with rickets and other diseases. Thus the foundation is laid for a ruined stomach digestion, for bowel troubles, etc., which may last for life, and may lead, by way of auto-intoxication, to cancer.

When the children grow older and are put on a mixed diet, the mixture given is very frequently quite inappropriate. In volume 2 of the important work, *Epidemiology and Public Health,* edited by Dr. Victor C. Vaughan (H. Kimpton, 1923), we read on page 30:—

"The children of the well-to-do, and many of those of the poor, eat too much carbohydrate and drink too little of good rich milk. This is true in the city, in the village, and on the farm. Coffee or tea takes the place of milk in

the early years of life; white bread has practically driven the whole wheat products from the market; sweets which contain no vitamine of any kind are consumed in large quantities, ferment in the alimentary canal, encourage the growth of bacteria, destroy all desire for vitamin containing food, growth is arrested in the young, and the degree of invalidism among adults is increased."

Not only children of the poor but also those of the well-to-do have often their health ruined by "scientific foods," which cause scurvy and other diseases. On page 37 of the book *Vitamins and the Choice of Food,* by Violet G. Plimmer and Professor R. H. A. Plimmer, London, 1922, we read:—

"Dr. Northrup, at a time when infantile scurvy was still rare in the States, wrote a vivid description of the circumstances under which the disease commonly appears:

" 'The patient was the offspring of wedded representatives of rich and powerful families in the fashionable and political worlds. There was no lack of love and devotion. The lack was in wisdom and judgment; the abundance—the nurse's self-esteem and ignorance; these allowed the present case and history to continue on to full accomplishment.

" 'The child was sixteen months, a girl. Thriving very well in early months; breast-fed four months. After this the child was fed on a proprietary food diluted with water and milk; by mistake too little milk was used. The child apparently thrived well, though backward in walking and talking. The teeth were normal; there was no sign of rickets.

" 'Three weeks previously (to consulting Dr. Northrup) the nurse had noticed some slight change in the child's gums. The family doctor ordered more milk to rectify the mistake, beef broth, and iron peptonate. One week later there was trouble in the lower right limb, evinced by worry-

ing sensitiveness on handling and a tendency to keep the limb straight. Rheumatism was diagnosed, but antirheumatic treatment had no effect.

" 'The parents went away for a fortnight and the doctor was not called in. The nurse drew no conclusions from the rapidly changing gums. The parents returned and found the child ill. (Dr. Northrup was now called in.) The child cried on seeing a strange face and became alarmed for the safety of its lame leg. In the wry face of crying the little patient fairly unbuttoned from between its lips two rows of irregularly nodulated purple gums, from the summits of which the points of the teeth protruded. The gums were dark and bled freely in the act of crying from the compression of the lips alone. There was no nose-bleeding, nor purple spots on the skin, no blood in the urine nor bleeding from the bowel. Spongy gums and swollen thigh were the only symptoms.

" 'Confirmation of the diagnosis of scurvy was given by the success in treatment. The child was sent to the country and received fresh cow's milk instead of the proprietary food, beef juice and baked potatoes. The one thing which the child seemed to crave, for which it reached out, and which it seized with ravenous avidity, was the orange. The child could scarcely be restrained till it held the fruit in its grasp and then proceeded to souse its lips and nose in the juice.

" 'Improvement began at once. The gums were normal in 10 days; in a month the child could stand. Soon she appeared as a child small for her age, but as if nothing had ever been the matter with her.' "

Not only the children have their constitutions undermined by unwise feeding. Unwisdom in the selection and preparation of food has become general among people who foolishly turn away from natural food, being misled by their appetites and the pandering attentions of food manufacturers and

food chemists. One of the greatest biologists living is Sir Arthur Keith. He stated on page 217 of his excellent book, *The Engines of the Human Body,* London, 1919, which ought to be read in every school:—

"In recent centuries man entered another stage in his rapid progress, one in which the food products of the world came to be emptied on the lap of civilization. He directed his efforts to obtain the most concentrated and assimilable forms of food possible, and succeeded. Every means became employed for cooking and preparing food to pamper and excite a jaded appetite, one often beyond the natural needs of the body. The human machine has thus come to be supplied with a form of fuel for which its alimentary equipment was never designed.

"Nature spent millions of years in fitting out a laboratory to deal successfully with the natural refuse of the small bowel; and now under modern conditions of diet we call upon it to perform duties for which it was never intended. When it breaks down from disuse or from having to deal with refuse of a new kind is it surprising that Nature levies her fines? . . .

"The human machine is designed for a mixed diet of a kind which modern conditions of life bring within the reach of most people. Every one, by a little observation, can find out the quality and quantity which best suits the working of his own machine. Vegetables, fruit, cereals, will at all times provide sufficient work to keep the big bowel in good order."

In an article entitled "Deficiency Disease," published in the *British Medical Journal,* of the 19th June, 1920, Colonel McCarrison told us:—

"At present the problem before man is to obtain a satisfying meal. This he frequently does by loading the stomach

two or three times a day, it may be with boiled polished rice, vegetable oils and spices, or with white bread, margarine, and jam; or in the case of infants, with almost vitamine-less proprietary foods, sterilized and diluted milk. Such meals are dangerously unbalanced and dangerously deficient in vitamines and in suitable protein and excessively rich in carbohydrates."

Unfortunately, civilized men have lost the instinct of right feeding which is possessed by animals. An animal will do almost anything to obtain the foods and other elements required in its nutrition. The shyest deer will brave the greatest dangers to obtain salt. They will travel incredible distances to obtain a certain element needed by their bodies, and if they cannot obtain what they need they are apt to go mad. They will eat filth, even their own filth, and their young. When pigs, cats, dogs, and other animals kept by men eat their litter, they do not do it because they are "inhuman," but because they are inhumanly fed on food which humans may think adequate, but which is deficient in some important element or other. Colonel McCarrison has told us on page 37 of his valuable book, *Studies in Deficiency Diseases*:—

"Among animals, instinct is a powerful protective agent against deficiency diseases. . . . Anyone who watches the monkeys confined in large open-air cages in the Zoological Gardens must have noted with what eagerness they rush to secure a fragment of cabbage-leaf or other green food with which one may come provided. Fowls will consume their own feathers or those of their neighbours although supplied with an abundance of deficient food. This habit is one of the most outstanding symptoms of avitaminosis

in these birds. I have known them kill one of their number and eat portions of its body, impelled to cannibalism by the instinct which prompts them to make good the food deficiency; deficiently fed rats may behave in the same way. This desire for fresh food, so universal in the animal kingdom, must possess some secret advantage in the preservation of the race."

The foremost authorities on food and feeding condemn modern methods of feeding among civilized people. The weighty opinions given might easily be supported by 20 or 30 further quotations. However, the few selected should suffice to show that we are weakening and ruining our bodies by the things we eat, and we cannot be surprised if we have to pay a heavy penalty in the form of certain avoidable diseases, of the diseases of civilization, among which cancer stands foremost.

Having shown that our methods of feeding in general are disastrous and are bound to injure us permanently, I would like to consider the position with regard to some of the more important foodstuffs.

The most important foodstuff of all is probably milk, because the health of growing children is very largely determined by the quantity of milk they get and by its quality. Milk, as produced by the cow, is not only a perfect food for calves, but also for humans, and especially for young children, except for infants, who, of course, should be suckled. We cannot improve on such a wonderful food as natural milk. We can only lower or destroy its food-value by tampering with it. Unfortunately, hardly any

milk reaches the people in the towns in its natural condition. Part of the butter-fat is abstracted, and often it is mixed with water, and thus the natural balance of the food is destroyed.

After having been deprived of part of its fat, it is frequently "sterilized." The milk vendors tell us that this is done for our own good, because sterilization by heating "destroys the germs of disease." It is true milk is a frequent carrier of disease, because it is a most excellent culture medium for bacteria, which flourish and rapidly multiply in milk. We are told in particular that sterilization destroys the micro-organisms of tuberculosis. However, tubercle bacilli and other disease-bearers can live apparently almost indefinitely in butter. The sterilization of milk is therefore no complete protection against milk-carried tuberculosis.

After our milk has been deprived of its fat and heated—in the heating process invaluable food elements are destroyed, as will presently be shown—it is frequently further "protected" for our benefit by the addition of poisonous chemical preservatives, as described in Chapter XI, preservatives which are responsible for a great many illnesses and deaths among the consumers of milk, and especially among children.

Milk contains not only harmful micro-organisms which had better be destroyed, but also beneficial and necessary organisms which also may perish if the milk is heated. Pasteur found at an early date that heating at 60° C. (144° F.) killed most of the ordinary forms of bacteria in food after a short

time, and many of these bacteria are absolutely indispensable to us.

Children in the towns are given not only pasteurized milk which has been sterilized by heating—in many towns no unpasteurized milk is available—but they are fed on dried milk as well, and we are told that both are better and safer than the natural article. Of course, any chemist can improve upon Nature. It is the easiest thing in the world—in theory. In reality, the use of pasteurized and dried milk is highly objectionable for many reasons.

On the 25th April, 1923, a Conference on the Milk Question, organized by the Royal Society of Arts, took place, and the proceedings are reported in the *Journal of the Royal Society of Arts* of the 29th June, 1923. Addressing the conference, Professor J. C. Drummond, dealing with the changes which occur in the digestibility and nutritive value of milk on heating, stated:—

"Whilst being the last to deny the benefits which such a process has yielded in the past, we insist on regarding it as a temporary departure from Nature necessitated by existing conditions, but to be given up as soon as it can be safely dispensed with. The grounds for this opinion are that all unnatural treatment of foods should be excluded as far as our cultural customs will permit, because even to-day, with the wide advance in our knowledge of the biochemistry of foodstuffs which has taken place in recent years, we are appallingly ignorant, although deeply sensible, of the complexity of such biological materials. . . .

"An example of this is provided by certain forms of dried milks which have been prepared by what is known as the 'roller' process. In this method of preparation the milk suffers exposure to a temperature above boiling-po nt

for a very short time, and yet the final product shows great changes in its main characteristics. Practically all the coagulable proteins have been rendered insoluble, and the delicate emulsion of fat has been so damaged that on reconstitution almost all the fat separates as a butter-like mass instead of as cream. If these and other obvious changes have occurred, how great is the probability that many other alterations, as yet undetected or of unknown significance, have also been induced.

"From studies of the digestibility of milks in the living animal by methods which enable each stage in the passage of the various constituents through the alimentary tract to be observed accurately, we have been deeply impressed with the far-reaching effect of many of the apparently negligible changes which occur in milk during heating, especially that which occurs during some forms of drying.

"Our experiments have, as yet, progressed a very short way, and it is too early to bring forward any definite views, apart from the opinion already firmly established in our minds that it is impossible to heat a delicately balanced colloidal complex, such as milk, without bringing about very many changes.

"Some of these changes are already known to be undesirable, even if they are usually slight, such as the loss by oxidation of the indispensable vitamines; the significance of others, such as the changes in the character of the clot formed in the stomach, is as yet imperfectly understood; whilst, lastly, there are the many changes as yet undetected which later knowledge may show to be as important as those which are now receiving attention. The aim must be to supply milk to human beings as it is given by the cow."

Another high authority, Dr. S. S. Zilva of the Lister Institute, considered the effect of heat on some physiological principles in milk. His remarks were reported as follows:—

"When the value of a food like milk is fully considered, it is difficult to get reconciled to the notion that pasteurization is an ideal mode of treatment. Researches in the province of nutrition have made it quite clear that the nutritive value of an article of food does not entirely depend on its calories, its inorganic constituents, or even on the biological value of the protein it contains. It is now known that it depends to a great extent on some physiological principles, the character of which is only vaguely known to the scientific men of the present day. . . .

"Most means which destroy harmful organisms also destroy its biological properties. The obvious problem before us is, therefore, not to tamper with the milk, but to devise means compatible with economic exigencies which will obviate the infection of milk."

In the course of the proceedings, Dr. John Donald said:—

"It was not so much a matter of bacteriology as of biochemistry. The latter science was only in its infancy, and he thought it would yet be proved—justifying what experience suggested—that there is a vital something in milk which is detrimentally affected by heat. What many felt was that what was required for a child, especially a delicate child, was a milk that had not been tampered with by heat; or, in other words, raw milk; and that essential nutriment, physical, mental and spiritual, was to be obtained from raw foods, especially milk. . . .

"Three vitamines were referred to, but there might be, and probably were, twenty vitamines in milk and green vegetables. It was all very well to say, for example, that Vitamine B was not destroyed at boiling point, but he was convinced that in fresh green vegetables there was something more than Vitamine B about which nothing was known, and which is destroyed at that temperature."

The speaker was followed by Dr. Robert Mond,

of the Children's Hospital, who made some very caustic and some very noteworthy remarks. The Journal summarized them as follows:—

"Dr. Robert Mond said that it had been said that the man who heated good milk was a fool, and the man who heated bad milk was a knave. He did not think that the case could be better put.

"At the Infants' Hospital he had taken a great interest in the question of trying to work out the best method of preparing pure raw milk. If the milk was heated, the lime contents were reduced and that lime was essential to the building up of the bone structure of the infants, the albumen was coagulated and, according to the temperature employed over a certain heat, this favoured the growth of certain putrefactic bacilli.

"If the defæcations were examined, they could trace many of the ailments the babies suffered from to the way in which the milk had been abused. As a matter of fact, heated milk kept at summer temperature 24 hours was one of the best things he knew of for killing babies.

"They had carried out a number of experiments, feeding kittens on this milk, and the kittens had died at the end of a fortnight. Babies could be saved by giving them raw milk, because nature had arranged that acid bacilli should be present in milk and these were a safeguard of life. Now he took it that the real reason why people scalded or pasteurized milk was a very simple one. Milk easily became sour by keeping, and pasteurizing it was the most convenient way of preventing it getting sour."

Professor Drummond said that the heating of milk brought about "very many changes, some of which are already known to be undesirable," and alluded to the "far-reaching effect of many of the apparently negligible changes which occur in milk during heating, especially during some forms of

drying." Dr. S. S. Zilva told us that "most means which destroy harmful organisms also destroy its biological properties." Dr. Robert Mond stated that "the man who heated good milk was a fool and the man who heated bad milk was a knave" and that, according to his experiments made on kittens who had died by drinking it, "heated milk kept at summer temperature 24 hours was one of the best things he knew of for killing babies."

It is a great misfortune that breast feeding by mothers is becoming more and more unfashionable in the towns. Instead of being given sound mother's milk, the poor infants are given milk intended for calves which has been grossly adulterated and completely spoiled by the addition of chemicals, heating, etc. Interested vendors tell the mothers in flamboyant advertisements that their "improved" cow's milk in a liquid form, dried milk, tinned milk and so-called infants' foods are as good as, or better than, mother's milk. Yet it is a universal experience that mother's milk, which is the natural article for a child, even if of inferior quality, is better than the best cow's milk or any other substitute. Of course, mother's milk cannot be good if the lactating mother lives on unnatural devitalized foods, as town mothers do only too often.

Poor little babies are given not only abominations such as chemically treated and adulterated liquid cow's milk, dried milk and tinned milk, all of which contain the larger part of the original butter fat, or all the butter fat, but they are even given skimmed milk devoid of butter fat by the more

ignorant mothers. The result is that thousands of children are slowly starved to death or are starved into chronic disease. Drs. Parkes and Kenwood have told us on page 370 of their volume *Hygiene and Public Health,* 6th Edition, London, 1917:—

"It has been suggested that the condensed skimmed milks should be compulsorily labelled 'Unfit for Infants.'

"The injurious results upon many infants of feeding them with condensed skimmed milks are malnutrition, resulting in emaciation and atrophy, or, in some cases, rickets and scurvy rickets. Many such infants die before their first year is completed from convulsions, diarrhœa, bronchitis and pneumonia. Those which survive infancy are often stunted, ill-developed and mentally backward. Enlarged tonsils, adenoids, defective formation of the jaws, with irregular dentition, and all the evils these conditions give rise to, are undoubtedly commoner in children whose diet has been deficient in fat and relatively much too rich in carbohydrates (cane sugar), than in those whose early feeding was more in consonance with physiological requirements."

Mothers and nurses are often lamentably ignorant. Their heads have been filled with pseudo-scientific notions. They have lost their common sense and they dispute the experience of countless ages as to the value of natural food. We read on page 129 of the valuable book *Vitamines and the Choice of Food,* by Violet G. Plimmer and Professor R. H. A. Plimmer, London, 1922:—

"Milk for the infant is the natural source of this vitamin and must be treated with care. Like vegetables, it loses value on heating; boiling for a short period is less destructive than keeping at a lower temperature for a longer

period. The re-heating of milk completely destroys the C-factor. Many cases of scurvy in infants have been caused by the use of commercially pasteurized milk being re-heated once or more often in the home. The addition of alkali in any form to milk foods for infants should be avoided.

"The diet of the nursing mother should contain fresh fruit and vegetables, since it has been shown that the anti-scorbutic value of milk depends on the diet. Cows' milk is richest in this vitamin when they are at grass.

"It is a common practice of maternity nurses to forbid the mother to eat green vegetables, as they are supposed to give the baby wind, and to forbid oranges and other fruit, because the acid juice is supposed to curdle the milk. The infant will thrive best if the mother eats some fruit and vegetables, and no amount of acid taken by the mouth can curdle the milk in the breast."

During the first year of their existence the foundations of gastro-intestinal degeneration and disease are laid among the unfortunate infants. We cannot wonder that half the cancer deaths originate in the stomach and thereabouts.

Naked Kaffir babies, born near the Equator, and Esquimo babies of the barren North are brought up in a more healthful and in a more sensible way than the sheltered babies in civilized countries.

CHAPTER XIII

The Defects of Modern Feeding and their Relation to Cancer—The Food Mistakes and Food Vices of Adults

In the previous chapter, the feeding mistakes in general and the mistakes made in the feeding of infants in particular have been considered. In the present one, I wish to deal with the remaining aspects of the food problem.

After milk, the most important foodstuff we consume is bread. To millions of people, bread is the principal article of food. It is to them, indeed, the staff of life. Unfortunately, bread also is "improved" by the makers and the result is that we are fed with an article which looks tempting, tastes nice, and goes down almost without chewing, but which lacks the most precious substances contained in wheat. These most precious substances are ground off and either thrown away or are fed to animals which have sufficient instinctive discrimination to see a most desirable delicacy in the husks which we reject. The staff of life has become a delusion and a most unsafe support to lean on. Professor Roger I. Lee, of Harvard University, wrote in his book *Health and Disease: Their Determining Factors,* Boston, 1917, on page 48:—

"As civilization has advanced the highly milled products, which contain less of the husk and more of the kernel and thus less of the vitamines, have increased in use. Then, too, experiments seem to indicate that the alkali which is found in baking soda tends to destroy the vitamines of the bread and thus still further diminish the already low vitamine content of the bread from the highly milled cereal. This may prove to be a problem of increasing seriousness since, particularly among the poor, there has been a marked falling off in the use of the vitamine-rich foods, ordinarily used, such as fresh eggs, fresh milk, meat, fresh fruits and vegetables."

Professor Lee rightly pointed out that the husks of most of the grains which men consume are rejected. The effect of eating rice deprived of the husk and germ is described in Chapters II and IX, in which it is shown that polished rice causes beriberi, a most horrible disease. Other kinds of grain are as unsafe a food as rice if deprived of their husk.

Drs. Parkes and Kenwood tell us on page 324 of their book *Hygiene and Public Health* previously mentioned that, according to numerous experiments made, pigeons, mice and rats can be kept in health when fed on wholemeal bread and water, but that they die after being fed for a few weeks on white bread and water. We read:—

"The vitamines in the cereals, including wheat, oats, maize and barley, are also contained exclusively in the outer coat. The observations of Hopkins, Hill and Flack show that a diet of wholemeal bread and water suffices to keep pigeons, mice and rats in health, but these animals cannot exist for more than a few weeks on white bread and water. . .

"Foods are robbed of vitamine not only by modern milling processes, but also by super-heating in the process of canning, and by boiling and stewing if the water is thrown away. The anti-beri-beri vitamine is destroyed at 130° C., but the anti-scurvy vitamine is destroyed at temperatures but little above 70° C. The latter fact explains the occurrence of scurvy rickets in infants fed exclusively on sterilized milk and certain patent foods."

During the Great War a very serious shortage of food occurred in Denmark, a country which subsists largely on imported food. In order to meet the difficulty, the Danish authorities did not merely mill a high percentage of their grain as other nations did, but ground up the whole of the grain. The people lived on real wholemeal bread, and to the whole meal was added all the bran which in normal times was given to the Danish livestock. The result of that policy is described by Dr. M. Hindhede, the eminent food scientist, in a most interesting article "The Effect of Food Restriction during the War on Mortality in Copenhagen," which will be found in the *Journal of the Americal Medical Association,* vol. 74, 1920, on page 381. Dr. Hindhede stated:—

"We ate all our bran ourselves. We not only ate whole rye bread, but we mixed all our wheat bran with the rye flour and were able to bake good bread in this way. The Germans were unable to bake good rye bread. Their bread was too sour and too soggy. We were fortunate in having had more than 100 years of experience in this direction. Our principal foods were brown bread, barley, porridge, potatoes, greens, milk and some butter. Pork production was very low; hence the farmers ate all the pork they raised, and the people of the cities and towns got little

or no pork. Beef was so costly that only the rich could buy it in sufficient amount. . . .

"In the accompanying table I give some data on the numbers of deaths per 10,000 population in Copenhagen, between the ages of 25 and 65 years.

Year	All Diseases	Epidemic Diseases and Tuberculosis	Other Diseases	Ratio
1900.....	152	46	106	97
1901.....	151	41	110	101
1902.....	131	30	109	100
1903.....	142	34	108	99
1904.....	137	36	101	93
1905.....	148	41	107	98
1906.....	144	33	111	102
1907.....	145	31	114	105
1908.....	152	35	117	107
1909.....	142	31	111	102
1910.....	135	26	109	100
1911.....	148	32	116	106
1912.....	138	30	108	99
1913.....	130	28	102	94
1914.....	133	27	106	97
1915.....	134	26	106	97
1916.....	145	35	110	101
1917.....	123	33	90	83
1917–18.....	99	27	72	66

"I wish to call attention to the unusual amount of bran consumed by the people of Denmark during the period of food restriction. In other countries, for example Germany, Holland and Norway, the question was discussed whether grain should be milled to yield 70, 80, 90 or 94 per cent. of bolted flour. We not only milled our rye to 100 per cent., but, profiting by previously made experiments, we added all our wheat bran to the whole rye bread; and as

we added also 24 per cent. of barley meal (milled to 90 per cent., only the coarsest shells being removed) we had more than twice the amount of bread we would have had if we had milled only to 70 per cent. . . . And, be it emphasized, we could bake good bread with this mixture. People entered no complaints, there were no digestive troubles, but we are accustomed to the use of whole bread and we know how to make such bread of good quality. If further proof were needed, this war experiment on such a large scale has demonstrated that bran is excellent food."

Dr. Hindhede's account is most remarkable. It will be noticed that during the period of extreme food scarcity, when the Danes lived on bread containing not only all the bran belonging to the bread-corn, but an overdose of bran from other sources, the general mortality and the tuberculosis mortality fell to the lowest point ever known.

Sir Hermann Weber, the well-known doctor, who died at the ripe old age of 95, told us on page 79 of his book *On Means for the Prolongation of Life,* London, 1914:—

"There are a great many kinds of bread, differing according to the quality of the corn, the fineness of the flour, the manner of preparation, and the removal of parts of the corn or the addition of other substances. We cannot enter into a description of the different processes of baking or the numerous kinds of bread, but must say a few words about so-called brown bread as compared with white bread. Professor Graham, the celebrated chemist, afterwards the Master of the Mint, was the first who, in a scientific way, brought the advantages of using, in the preparation of bread, all the constituents of the wheat—the bran as well as the fine flour of the centre—before the public. As Liebig devoted a special article in his celebrated 'chemical

letters' to Graham's plan, the term 'Graham Bread' was adopted on the Continent.

"Since Graham's and Liebig's time it has been found that the removal of the outer layers of the grains of wheat, rice and barley may cause polyneuritis beri-beri, and a kind of scurvy in those who live entirely or principally on the finest part of the flour or on polished rice. Feeding experiments on animals have corroborated this experience (Leonard Hill and Martin Flack). The loss of the greater part of the mineral matter must be regarded as the cause of these troubles, since the addition of bran to the food removes them. Not all kinds of brown bread, however, are the same.

"The majority of bakers mix a varying amount of bran with white flour, not always in a fixed proportion, while Graham wanted the bread to be prepared from all the constituents of the whole corn—'wholemeal bread' or 'wheaten bread.' The corn may be so thoroughly ground that the flour is comparatively fine to suit certain delicate conditions of the intestines, or only roughly ground, making a coarser bread more useful to many persons troubled with habitual constipation. This kind of bread is nutritious, easily digestible to most people, and helpful in assisting the action of the bowels. Some persons, with an irritable mucous membrane, or with a suspicion of ulceration in the stomach or intestines, ought to use a bread prepared from a finely ground corn, which, however, ought to contain the germ and part of the bran.

"A larger proportion of brown bread passes off with the fæcal matter than of white bread, owing to the great amount of cellulose contained in the bran; a slightly smaller proportion of brown bread is absorbed than of fine white bread, and brown bread is therefore considered by many persons as less nourishing. This view, however, must be taken with reservation. There are, no doubt, as the experiments alluded to show, substances in the outer part of the grain which are necessary to the body, though we do not

yet know their exact nature, and those are absent in the finest white bread.

"In the mixed diet of most persons, bread forms only a part of the food and the substances referred to may be contained in the other parts of the food. Considering the advantages and disadvantages of white and brown breads, the advantages of the latter predominate for the majority of people. This, at all events, is the result of my experience after long-continued observation on a great number of persons."

Civilized nations which used to live, as regards cereals, chiefly on wholemeal bread made from barley, oats, and rye, are living more and more on wheat which, it is true, makes a more palatable and a more attractive-looking loaf than the three other cereals mentioned. However, it may be doubted whether wheat is the best of the cereals. Dr. McCollum made some most interesting experiments on cattle which seem to indicate that wheat is far inferior to maize (or corn) and to oats. His experiment has been described as follows in Vaughan's *Epidemiology and Public Health* (Kimpton), 1923, vol. 2, page 22:—

"McCollum began his researches. This talented investigator, working at the Wisconsin Experiment Station, took four groups of heifers, weighing about 300 lb. each. Each group was kept separately, properly stabled and allowed the run of an open lot free from vegetation. The sole food of the first group consisted of the wheat plant, the grain, straw and the addition of wheat gluten; the second group was confined to the corn plant and its products, including grain, corn gluten, leaves and stalks. The third group had only rolled oats and oat straw, while the fourth group,

intended to serve as controls, was fed about equal parts of wheat, corn and oat products. All the animals in these groups were watered from the same supply and had common salt *ad libitum*. All ate about the same amount, apparently digesting it, and suffered from no recognized disease.

"After one year on these diets the members of the corn-fed group were sleek, fine, and apparently in an excellent state of nutrition. The members of the wheat-fed group were rough-coated, gaunt, and of small girth. The weights of the two groups did not differ materially. The members of the oat-fed group and of those fed upon the mixed plants stood intermediate between the corn and wheat lots. The corn-fed animals were in every way better off, at least of better appearance, than the members of any other group.

"In due course of time all these animals produced young. The calves of the corn-fed animals weighed at birth from 73 to 75 lb., came at the right time, were able to stand and nurse within an hour after birth, and grew into vigorous animals. The young of the wheat-fed group averaged 46 lb. at birth, came from three to four weeks too soon, and were either born dead or died within a few hours. The young of the oat-fed animals averaged 71 lb., came two weeks too soon, one of the four was born dead and two were weak and died within a day or two, while the fourth was weak but was kept alive with care. The young of those fed upon the mixed plants were weak, one was born dead and one lived but six days.

"During the first 30 days of lactation, the average production of milk per day for each animal in the corn-fed lot was 24.03 lb.; in the wheat-fed, 19.82 lb. The only abnormality that could be found in the excretions of these animals was that, while the urine of the other groups was neutral or alkaline as it should be, that of the wheat-fed group was distinctly acid. No explanation of this difference has been found. These animals were continued under the experiment through a second period of gestation and

lactation with no material differences from those that characterized the first year."

For cattle, wheat seems the least nutritious cereal. However, it must be remembered that a single experiment is not conclusive and that the physical requirements of cattle and of men are very different. Still the experiment suggests the enquiry whether wheat is as desirable a grain for men as those grains which it has superseded and on which our ancestors were raised.

The extraordinary importance of vitamines has been described in Chapter IX, and in the beginning of the present chapter. Green vegetables and fresh fruit are particularly rich in vitamines, but these mysterious bodies are apt to be destroyed by overlong cooking. Long exposure to heat destroys the vitamines not only in vegetables and fruit, but also in meat. Lack of fresh vegetable and fruit causes scurvy after a short time, but chronic, though slight, deprivation of the vitamines contained in the uncooked vegetables and fruit may be as harmful, although it need not lead to scurvy. Prolonged, though slight, deprivation of these vitamines may, and probably will, weaken and undermine our strength and health.

We read on pages 117 and 118 of the book *Vitamines and the Choice of Food,* by Violet G. Plimmer and Professor R. H. A. Plimmer, London, 1922:—

"One of the earliest signs of inadequacy of diet is a lowering of resistance to infection. In the laboratory, con-

trol animals on a normal diet remain healthy, while neighbouring animals on a deficient diet suffer from epidemics of often fatal diseases of the lungs, eyes and digestive tract. The hygienic conditions are the same for all, but the infections do not spread from the ill-fed to the well-fed.

"It is not to be inferred from this that the spread of such diseases as scarlet fever, smallpox or measles can be checked by attention to diet, but there is a considerable amount of evidence which indicates that certain diseases, such as tuberculosis, pneumonia, ulceration of the cornea of the eye, dysentery and inflammatory conditions of the digestive tract, show a marked predilection for people on an unbalanced diet. Influenza may possibly belong to this category; certain individuals get it again and again, while others never take it even when often in contact with the disease. The United States Public Health Reports (1919) record the failure to infect seventy-eight volunteers, either by cultures or secretions from virulent cases of influenza. This fact suggests that lowered resistance is a necessary factor before the infection can establish itself; in many cases the lowered resistance may result from food lacking in vitamines. . . ."

"Feeding experiments on animals and clinical experience with human beings have proved that the cases of deficiency disease which are most intractable to treatment, and are often incurable, are those slow, chronic cases arising from a partial deficiency continued over a long period. This long-continued partial deficiency of vitamines in the food becomes a menace to the health of the middle-aged. McCarrison considers that the continued use of foods poor in vitamines is responsible for a general derangement of the functions of the digestive tract. Its resistance to infection is thus lowered; the secretory and digestive functions are impaired; its powers of assimilation are reduced; the nervous and muscular mechanism controlling the movements of the stomach and bowels becomes ineffective. These conditions lead to such disorders as dyspepsia, dilatation

of the stomach, gastric and duodenal ulcer, obstinate constipation, catarrhal conditions of the digestive tract, colitis, etc. McCarrison's conclusions are based upon many years' clinical experience and upon research work carried out at the Pasteur Institute of Southern India."

The Western nations consume too little greenstuff. Mistaken scientists have taught for so many years that green vegetables had little or no food value that people have concentrated their attention upon the theoretically nutritious foods, many of which are poor in vitamines. Besides the food chemists, having done untold mischief in the food factories where they have destroyed the vitamines, replacing them by poisonous preservatives, have at last invaded even our kitchens and have recommended to credulous housewives the free use of chemicals. Almost universally soda is being used in the cooking of vegetables, partly because the addition of soda accelerates the cooking, partly because it preserves their colour. Besides ordinary soda, bicarbonate of soda is employed in making bread, pastries and cakes, in preparing infants' food, etc. The result is disastrous, for the chemicals used destroy the vitamines. We read on page 67 of the book of the Plimmers previously mentioned:—

"C-factor is rapidly destroyed by alkali, such as common washing soda, sodium bicarbonate or the alkaline citrates. The destruction is particularly rapid if heat is applied at the same time; hence the practice of boiling green vegetables with soda to improve their colour is greatly to be condemned. The preparation of infants' foods by adding sodium or potassium carbonate to the milk mixture has

proved to be productive of infantile scurvy. Faber has shown that the antiscorbutic value of milk is seriously reduced by the addition of 0.25 per cent. of sodium citrate."

In hotels, restaurants, and private houses, dried vegetables which require little labour in preparation are replacing the fresh article. They look nice but taste rather stale, and they have, as a rule, lost, in the process of drying, the vitamines which constitute their principal value. The investigations of Shorter and Ray show that factory-dried vegetables have been deprived of their original anti-scorbutic qualities. Dr. L. Emmett Holt has told us on page 178 of his book *Food, Health and Growth,* the Macmillan Co., 1922:—

"That dried vegetables are practically valueless as anti-scorbutics, was shown as long ago as the Crimean War, and the observations have been confirmed in all the subsequent wars in which they have been tried.

"Fresh meats are anti-scorbutic if the amount taken is liberal. Arctic explorers have subsisted for months with no other stores of this vitamine in their diet and have been free from scurvy. But this is not true of canned meats; they are practically without anti-scorbutic value. The British soldiers while besieged in Kut ate freely of fresh horse flesh and escaped scurvy; the Indian troops, however, who are vegetarians, suffered severely from it, as they could get no fresh vegetables.

"From the point of view of the nutrition of children, the chief interest attached to the fact of heating upon Vitamine C relates to the heating of milk. In the first place it should be understood that the amount of this vitamine in fresh milk is very small. How small may be appreciated from the fact that Chick and Hume found that

to protect a guinea-pig, whose food contains no other source of this vitamine, 100 c.c. daily of fresh milk are required, although complete protection is secured by 1.5 c.c. of orange juice."

Dr. Holt's account clearly shows the advantage and necessity of consuming fresh vegetables, fresh fruit, and fresh meat, and of shunning dried vegetables, cooked fruit, and tinned meat. Unfortunately, the latter are becoming more and more the staple foods of millions. Dried vegetables give very little trouble in cleaning and preparing. Tinned fruit causes no labour except the opening of the tin, and the same applies to tinned meat. The convenience resulting from the consumption of all these prepared articles costs us very dearly, for they undermine our health and strength.

The wretched food chemists have taught our housewives not only to destroy the most valuable part of vegetables, the vitamines, by using soda, bicarbonate of soda, etc., in cooking them, but they have taught them also to use chemicals in making bread, cakes, pastries, jams, etc. The use of chemicals has become so universal that they are now sold mixed with the flour, and certain chemicals are obtainable in almost any ordinary shop. The old-fashioned housewife protected the jam with a piece of paper steeped in brandy, which was harmless. The modern housewife uses some poisonous preservative, such as salicylic acid, often without being aware of the fact that she is using a dangerous poison. Hence she does not mind adding a large dose of it "for safety," especially as it is tasteless.

Instead of employing real vanilla, real lemon peel, etc., for flavouring, the modern housewife uses chemical flavourings which are sold everywhere, and many of these are coal derivatives which may, or may not, be dangerous poisons which act cumulatively, as do so many poisons. Besides, she colours her culinary productions with coal-tar dyes, a proceeding which is certainly objectionable and possibly dangerous.

Dried peas, beans and lentils are staple foods to millions of people. They have been recommended to us by the food chemists as being very nourishing and they are a very popular food. They are indeed very nutritious and very satisfying, but unfortunately they do not contain the B vitamine, which is found in abundance in the fresh article. The Chinese are a very healthy people, although they live under very unsanitary conditions. Their good health is probably largely due to the fact that they understand the value of vitamines. They habitually cut up very fine both meat and vegetables before cooking them. Hence they require only a very few minutes over the fire and the vitamines contained in them are not destroyed. Furthermore, the Chinese eat dried beans, etc., not in the state in which we eat them. They put them in water and allow them to sprout and cook them when sprouted. Sprouted beans and peas, like all young greenstuff, are extremely rich in vitamines. In every Chinese restaurant in England and America, bean sprouts are served with almost every dish and they are very palatable. We cannot wonder that Europeans and

American experts are recommending that we should act similarly. We read on page 128 of the excellent book *Vitamins and the Choice of Food,* by Violet G. Plimmer and Professor R. H. A. Plimmer, London, 1922:—

"Dried peas, beans and unsplit lentils can be turned into true substitutes for fresh green vegetables by germination. The seeds are soaked in cold water for 24 hours, the water drained away and the seeds kept on a moist cloth exposed to the air till they begin to sprout. The flavour of peas and lentils is greatly improved by germination, and much less cooking is needed to soften them; germinated beans are not palatable."

Of late years the fashion of bleaching foodstuffs has arisen. We bleach our flour into unnatural whiteness, we bleach sultanas and raisins, we bleach our vegetables and salads. Apparently bleaching is destructive to the vitamines, and if chemicals are used, such as sulphur in bleaching sultanas, etc., there is a good chance of irritant poisons, especially arsenic, getting into the food. The bleached leaves of vegetables and salads are lacking in vitamines of the so-called A category.

As previously stated, wholemeal bread is rich in all the essential food factors, especially in vitamines, while white bread is very unsatisfactory in these respects. Unfortunately, real wholemeal bread is almost unobtainable in London and many other large English and American towns. The bread which is sold under various names, such as brown bread, wholemeal bread, etc., is not real wholemeal bread. Only a very few bakers make the real article

in small quantities for a few customers. The only way to obtain all the vitamines contained in the grain is to turn to oatmeal porridge of the coarser kind. Oatmeal porridge would be extremely satisfactory if housewives knew how to cook it. As a rule it is cooked far too long into a smooth pap, and very often it is cooked in the evening and reboiled in the morning. Prolonged heating and re-heating destroys the vitamines.

We sacrifice our health and strength to our palate. Children who have been vitamine-starved fall ill and become victims to rickets. The best remedy for rickets is cod liver oil, which is extraordinarily rich in vitamines. Instead of giving to weakly or rickety children and adults this wonderful oil in its natural condition, we allow our food chemists to "improve" it. The improvement of the food chemist has the usual result. In spoils the article. We read on page 76 of the work of the Plimmers previously quoted:—

"The value of cod liver oil in A-vitamin is reduced by refining to remove the fishy taste, or by emulsification and admixture with other ingredients to make it more palatable. The crude oil has also been found to be the best in the treatment of rickets. A sample of cod liver oil exhibited at a recent Sanitary Congress (1921) was described as 'tasting like a warmed-up pêche Melba'; the efficiency of such a pleasant preparation would probably be very slight, and it might have to be given in large quantities which would upset the digestion."

Modern civilized feeding has two great characteristics. Civilized nations are being starved of

vitamines in the form of green vegetables and especially of uncooked vegetables, such as salads. They are starved of vitamines in the form of the outer skin of grains of every kind. They are starved of the vitamines contained in uncooked milk and in fresh meat. While civilized men and women are being starved of all these essentials, they are being supplied with a superabundance of sugar. The increase in the consumption of sugar has been as extraordinarily great and as rapid as has been the diminution in the consumption of vitamines.

The wretched food chemists who have wrought incalculable mischief by encouraging us to throw away vitamines, by telling us that the kernel of the grain was the most nourishing part of it, that greenstuff had no food value, etc., have misled us still further by demonstrating to us with their clumsy instruments that sugar was a most perfect food, that it was completely absorbed by the body, etc. Complaining about the change from indispensable vitamines to sugar in every form, Colonel McCarrison, the eminent authority on nutrition and on vitamine starvation, wrote in the *Lancet* of the 4th February, 1922:—

"Sugar is consumed in quantities unheard of a few centuries ago, and sugar is devoid of vitamins which the cane juice originally contained. The use of stale foods, involving the introduction of factors incidental to oxidation and putrefaction, is the rule, that of fresh foods the exception."

Sugar is very pleasant to the tongue. Children and animals naturally take to it. However, it has

qualities which are little suspected by the many. It is a thoroughly dangerous food, and the prejudice against sugar and confectionery of all kinds which is met with among hale old people and old-fashioned doctors is thoroughly justified.

The ill-effects of sugar are manifold. In the first place sugar is a powerful irritant to the tissues. Dr. Robert Hutchinson wrote on page 277 of his valuable book *Food and the Principles of Dietetics*, London, 1922:—

"In strong solution sugar is an irritant to the tissues. In contact with the skin, it is apt to set up superficial inflammation. This is familiar in the form of the eczema which is apt to appear in diabetics from the contact of the sugar-containing urine with the skin, and from the similar condition occurring on the arms of grocers and other persons who have frequently to handle sugar, and it is on account of its irritating properties that sugar cannot be used as a subcutaneous aliment, though otherwise well adapted to fulfil that function. All attempts to use it in that fashion have been frustrated by the pain which it sets up. The same is true of the stomach. Brandl, experimenting on dogs, found that a 5.7 per cent. solution of sugar produced reddening of the mucous membrane; if the concentration was increased to 10 per cent. the mucous membrane became dark red, while a 20 per cent. solution produced pain and distress. This irritating effect on the mucous membrane is accompanied by the production of much mucus and the pouring out of a highly acid gastric juice. These irritating effects seem to be much more pronounced in the case of cane-sugar than in that of the glucoses. Aitchison Robertson injected 250 c.c. of a 20 per cent. solution of cane sugar into the stomach of a patient who was suffering from chronic gastric catarrh. Shortly afterwards the patient felt sick and vomited a very acid

fluid which put his teeth on edge. He complained also of heartburn and flatulence and of severe pain in the region of the stomach. Solution of invert sugar of the same strength produced no discomfort."

The over-consumption of sugar in every form has no doubt ruined many people. It is particularly harmful to children.

Dr. Paul Carton wrote in his book *Some Popular Foodstuffs Exposed,* C. W. Daniel, Ltd., London, on pages 36 and 39:—

"The sugar contained in vegetables and raw fruit is a living food, in combination with the protoplasm of the vegetable cells, associated with ferments and with vitalized nutritive salts. The work of the absorption of this natural sugar takes place by harmonious contact, by an exchange of energy between the living vegetable cells and our living digestive cells. Manufactured sugar, however, has lost contact with vitalized mineral salts and oxidizing ferments which make it healthy, and is a dead product. It is nothing but a drug, a dangerous chemical body, and our unaccustomed organs must make an unhealthy effort to assimilate it. The work of incorporation goes on by means of a damaging contact, causing a deviation of the action of the digestive cells; the viscera are irritated and overworked. . . .

"For anyone who knows how to trace the evils of sugar-eating, the lack of insight of those who encourage its consumption is incredible. The ravages it makes upon the sensitive organisms of children are particularly horrible. I am persuaded that of the 80,000 infants who die annually in France, more than one-half are the victims of the sugar put into their bottles. It is this deadly sugar, much more than the germs contained in the milk, which is the real cause of the digestive troubles, the enteritis, acute diar-

rhœa, restlessness and nervous troubles from which infants suffer so much.

"Sugar, moreover, is the indirect cause of those infectious disorders which are the scourge of childhood. Sugar shares the responsibility with meat. In saturating children with sugar, sweets, chocolate, we are, with a most lamentable unconsciousness, destroying their health.

"A one-year-old child is given, on the advice of the doctor, 120 grammes, that is to say, about eighteen pieces of sugar in its daily food. This dose alone would furnish more than half the necessary amount of calories. If, in the same way, you make an adult take half his rations in sugar, you would have to give him about forty-five lumps.

"No adult organism could long resist such an attack; yet we impose on the delicate viscera of unfortunate children the fantastic overwork implied in the assimilation of these quantities of poison. I never tolerate the smallest scrap of sugar in the bottles or foods of children to whom I am called. Thanks to this simple restriction the most delicate will thrive without accident."

The instinctive feeling of hale old people and of the most experienced old practitioners that immoderate consumption of sugar is very harmful is borne out by observation and by the latest discoveries of science. Everybody knows extravagant sugar-eaters. They are usually chronic dyspeptics. Very bad odours emanate from them, and they have a wretched complexion. As a rule, they are very constipated and are bad-tempered. Over-fondness of sweets almost invariably goes together with a dislike of vegetables and of fresh fruit and of fresh meat. Thus over-indulgence in sweets seems somehow or other to lead to vitamine starvation with all

its very serious consequences which have been fully described in the ninth chapter of this book.

Civilized men and women eat a prodigious quantity of sugar, often without knowing it. The canned fruit we eat contains an enormous amount of sugar. Half the weight and more of the jams and marmalades which are consumed everywhere consist of sugar. Sugar occurs in all fruits and in many vegetables such as carrots, turnips, peas, etc. In the natural state, in the form of fruit and vegetables, sugar is no doubt highly beneficial. Whether it is equally beneficial if extracted from sugar cane and sugar beets, concentrated and refined, must be doubted.

Unfortunately our food chemists have not only given us sugar in a very concentrated form, but they have "improved" that concentrated sugar by refining and bleaching it. In refining sugar, as in "improving" our breadcorn, the chemists have destroyed the most valuable parts of it. The public insists on the whitest sugar, as it insists on the whitest flour. Now white and chemically more or less pure sugar is deprived of its most precious elements and, like flour deprived of the husk, it is constipating. On the other hand, natural sugar in the form of honey and treacle is a most excellent laxative. The residue of the refineries which contains the vital portions of the sugar is largely fed to pigs and cattle, as is the precious residue of the flour mills. We cannot wonder that civilized men suffer from constipation and all the ills which spring from it, while primitive men and animals are

free from this complaint and all its serious consequences.

Why it is that heavy sweet-eaters are, as a rule, dyspeptics who have a bad complexion and are bad-tempered, has lately been explained by eminent scientific authorities. Prominent among the micro-organisms which poison our bodies through auto-intoxication are the streptococci which are found in our intestines. There are endless varieties of harmful micro-organisms within us, but they are kept strictly in check by their opponents who defend our health. Hence men leading a normal healthy life do not suffer from all the disease carriers which they harbour. Their bodies overcome them easily. Now these streptococci which are apt to poison our system, especially if we suffer from chronic constipation, flourish exceedingly and increase enormously if fed on sugar. That eminent pathologist, Dr. Nathan Mutch, of Guy's Hospital, London, stated in a most interesting paper which he contributed to Sir Arbuthnot Lane's book *The Operative Treatment of Chronic Intestinal Stasis,* London, 1918:—

"Certain streptococci abound even in healthy intestines. They are confined to the colon, form short chains of three or four cocci and cannot survive injection into healthy laboratory animals, but under conditions of disease . . . new races of proven infectivity appear . . . classified as Streptococcus longus. Amongst themselves they differ very greatly. . . . One property, however, has proved to be common to each of several hundred strains which have been examined, namely, the power of growing more quickly in 2 per cent. dextrose meat broth than in simple meat broth. With some strains the acceleration is not very great,

but with the majority it is extreme. Indeed, many strains planted in this medium double their numbers in half an hour at 37° C., and in 24 hours yield a thick, heavy deposit which, on shaking, produces a turbidity denser than that of a similar culture of Bacillus coli.

"Equal acceleration is induced by many other sugars, notably cane sugar, milk sugar and maltose. If waste products could be removed and fresh glucose broth supplied without limit, a single coccus would in three days' time give rise to progeny weighing a billion times a billion tons, and capable of destroying the entire sugar supply of the world in a fraction of a second. Fortunately such conditions are not present in the alimentary tract, growth being limited by rapid absorption of all soluble food through the mucosa, by competition with other bacteria, and by constant evacuation."

Sugar also promotes the growth of many forms of anærobic bacteria (akin to organisms of lockjaw and gas gangrene) which are formed in the intestines. They form poisons by putrefying the food and also throw out poisons from their own bodies.

In the paper mentioned, Dr. Mutch describes how the streptococci, the spreaders of disease and the causers of death, enter the body from the alimentary canal and poison the system. We cannot wonder that heavy consumption of sugar leads to gastro-intestinal disorder of every kind, followed by various serious diseases, among them cancer.

In countless advertisements we are urged to eat this or that denaturalized food because it is "easily digestible," because it is "wholly soluble," because it is "pre-digested," because, according to the analysis of some food chemist who knows nothing of biology, it contains so and so many per cent. of

protein, carbohydrate, or fat, etc. Pre-digested foods exist only in the imagination of food chemists, manufacturers and their victims. Digestion outside the human body, or pre-digestion, is impossible. Besides, all the "easily digestible" and "wholly soluble" foods clog and injure the system.

The human body wants exercise. Otherwise health and strength decline. If a healthy man lies in bed during two or three months his leg muscles shrink and, on getting up, he will discover that he is scarcely able to stand. The soft foodstuffs of modern civilization give no work to the teeth. Consequently our teeth grow soft and decay and at their roots putrefaction, called pyorrhœa, sets in. It is worth noting that dogs, especially pampered dogs, lose their teeth easily and suffer severely from pyorrhœa, as do their owners. That is not the case with dogs who are given hard food, bones, etc. From generation to generation our teeth become weaker because they are not used, and the weakening of our teeth is followed by the weakening of our jaws. The receding jaw is another feature of modern civilization. The bowels, like our muscles and our teeth, want exercise, want stimulation. After being weakened by vitamine starvation described in the special chapter dealing with that subject, they are further enfeebled by being filled with the soft pappy foods which form the diet of so many of us.

We feed our dogs more sensibly than we feed ourselves. We feed our puppies on hard biscuits and bones "because it is good for their teeth," but we bring up our babies on pap. Pap, scarcely fit for

puppies, has become the standard food of civilized man. Bread crusts are soaked or are thrown away. Everything we eat is boiled so soft that it becomes pap in our mouths. Chewing is no longer necessary. Puppy pap is not fit for grown or growing men and women. We cannot be surprised that the teeth of civilized nations decay, that their gums become foul and that our bodies are poisoned by the putrid matter which wells up from the septic gums and which is swallowed day and night.

Some years ago, when I was in the Zoological Gardens, an elephant caught hold of a broom which his keeper had left within reach of his trunk and ate it, including the long thick handle. I rushed to the keeper and told him, fearing that the animal might injure itself. The keeper laughed and told me that the elephant knew what was good for his health. He reported the matter, and a few days after, I saw the same elephant munching with evident relish an enormous bundle of dry sticks and branches. Sheep, cattle, horses and other animals also will eat the bark of trees and other indigestible stuff because they have the sense to know that their bowels want a mechanical stimulant. The fear that rough stuff will injure the tender bowels does not seem justified. The lions and tigers at the Zoological Gardens and our own domestic cats will crush and eat bones. The effect of the sharp splinters may be seen in the blood which is often found in their fæces. It appears that the big and the small cats will sicken unless they are given an adequate quantity of bones to activate their bowels.

The defects of modern feeding weaken our bodies and pave the way for cancer and other diseases. These defects are by no means limited to our selecting devitalized, embalmed and mummified foods, soft and pseudo-scientific foods, etc. Cooking was introduced for the purpose of softening food which otherwise would have been too hard for human teeth. As cooking destroys many of the vitamines, those mysterious elements of which we know so little, it is essential that we should eat as much uncooked food as possible. Unfortunately, a very mania of cooking has arisen. There are many people who eat nothing uncooked. Believing that cooked foods are more digestible, there are millions of people who never touch a raw salad, a raw carrot, a raw fruit, a raw egg, raw milk, etc. Yet no one can maintain that it is necessary to cook eggs to destroy harmful microorganisms which are not there.

Many writers on cancer have told us that that disease is due to wrong feeding and they have informed us, without bringing any proof, that we eat too much meat and too many condiments, that we drink too much tea, coffee and alcohol, that cancer of the stomach may be caused by eating hastily overlarge meals, etc. I think that all these factors are of comparatively little account. My impression is that the most dangerous thing about our meals is this, that we eat and drink things when they are far too hot.

For some reason or other burns seem to act as cancer producers. In the beginning of Chapter VI I have shown that often repeated slight burns by

X-rays and radium are apt to lead to cancer after 10, 15, or 20 years. Towards the end of the same chapter I have given a number of examples of large scars caused by burning being followed by cancerous growths after 20 years, 30 years or more. Indian natives of the northern hills, wishing to protect themselves against the cold, carry the kangri basket, a basket containing an earthern vessel filled with charcoal next to the skin. They are liable to suffer from a peculiar form of cancer, called kangri cancer, which attacks the abdomen and the thighs where the death-giving basket has touched and scorched the skin times without number. Locomotive engineers and firemen not infrequently get cancer in that portion of the body most exposed to the glare of the fire. We are therefore entitled to view with the gravest suspicion the habit of eating and drinking food which is boiling hot. We drink liquids which are so hot that we cannot put our fingers into them without burning them. Very likely a large percentage of these who suffer from cancer of the throat, œsophagus and stomach have acquired the disease by their mania for boiling-hot food. My own grandfather died of cancer of the stomach, and my father, an eminent physician, attributed the disease to his father's habit of swallowing large cups of coffee, etc., when practically at boiling-point.

The English Edition of the *World's Work,* of July, 1923, contains an interesting article, "Cancer: Its Prevention and Cure," by Francis Carter Wood, the director of the Institute of Cancer Research, Columbia University. The author states in it:—

"Cancer of the stomach unquestionably often begins in ulcer of the stomach, and it is no doubt true that the consumption of irritating food, highly seasoned or spiced, may have something to do with the origin of cancer in the susceptible.

"Unfortunately the walls of the stomach have no pain nerves, so that such foods can be taken without discomfort, but if all the irritating substances which are eaten during the course of a single good dinner be added up, it is not astonishing that the stomach occasionally becomes diseased, though the records show that most stomachs bear up bravely, for at least 40 years, before they finally rebel and allow a cancer to form. A considerable proportion of the malignant tumours of the lower bowel are directly correlated with inflammatory troubles in that region."

It is really a misfortune that "the walls of the stomach have no pain nerves." If a man finds the liquid too hot to hold in his mouth, he simply swallows it.

In the beginning of this chapter, it was shown that dogs and other animals hardly ever suffer from cancer of the stomach. Dogs are exceedingly greedy. They overload their stomachs habitually. However they, and all other animals, absolutely refuse to swallow anything very hot. Things which we think too hot for our dogs we recommend to our babies.

In the *Collected Papers* of the Mayo Clinic of 1917 we read on page 52:

"The theory that the frequency of cancer of the stomach in civilized man is the result of hot food and drinks which act to cause chronic irritation of the gastric mucosa is worthy of consideration. The infrequency of malignant disease of the stomach in animals and primitive man would

then be explained by the fact that they take their food and drinks cold. At the general meeting of the American Medical Association in 1912 I called attention to the possibility of hot drinks which might be the exciting agent, and during the past two years further investigation of the circumstantial evidence related to the facts leads me to believe that it may be one, if not the main, cause of the tissue changes which precede cancer of the stomach. Why should cancer of the stomach be more frequent in the male (38 per cent.) than in the female (22 per cent.). A possible answer to this question is furnished in the frequency of cancer of the posterior wall of the pharynx and upper gullet in Chinese men, who are served first whilst the rice is hot; the women eat at the second table when the rice is cold and rarely have cancer in this region.

"A high percentage of persons take their drinks hotter than can be borne comfortably in the mouth. It has been shown by X-ray workers that when the stomach contains much food, and drinks are taken, these drinks are not carried directly into the cavity of the stomach, but, by a peculiar muscular contraction, a canal (canaliculus gastricus) in the lesser curvature, along which the fluids are rapidly passed into the duodenum. Eighty-five per cent. of all cancers and ulcers of the stomach involve the lesser curvature and they may have a common cause. The mouth and gullet are protected by pavement epithelium and possess sensitive nerves which give warning of injury; the stomach has no such protection."

The fact that the mortality from cancer of the stomach and of the way leading to it is very much greater among men than among women is apparent from the comprehensive statistics given at the beginning of Chapter VII. I would repeat the salient ones:

SITES OF FATAL CANCER (INCLUDING SARCOMA) DURING THE 10 YEARS 1911–20

	Male Deaths	Female Deaths
Tongue	10,114	1,009
Mouth and Tonsil	4,640	712
Jaw	4,946	1,658
Pharynx	2,150	674
Œsophagus	12,059	3,850
Stomach	36,833	32,927
Larynx	4,780	1,359
Neck	2,685	658
Throat	428	101

In Great Britain there are considerably more women than men, and as women attain a higher age than men, it might be expected that cancer of the stomach and of the way leading to it would destroy more women than men. However, male deaths are in a very great majority, especially as regards deaths of cancer of the throat and of the œsophagus, the tube leading from the throat to the stomach. Those portions which receive hot food and drink at the highest temperature are, of course, the throat and the œsophagus.

The vast preponderance of men dying from cancer of that site is easily explainable. Men take their meals more hastily than women. Having to be in business or at the factory at a fixed hour, men get up too late. They sit down too late to breakfast and then hastily gulp down some cups of boiling-hot tea or coffee, while the women taken their meals at leisure. During the short mid-day interval again,

men at work habitually swallow too hastily over-hot food and drink. Besides, men, especially in cold countries, frequently indulge in boiling-hot whisky and water, etc., "to keep the cold out." Indian hill-men have their kangri cancer on the outside, while civilized nations have their kangri cancer inside.

I think I have shown that the defects of modern feeding are very important contributory causes in bringing about cancer. In the next chapter various other habits of life favourable to the development of cancer will be considered.

CHAPTER XIV

Wrong Habits of Modern Life and their Influence upon Cancer

In the last two chapters I have considered the faults of modern food and feeding and their influence in the causation of cancer. While discussing the disadvantages and dangers of the soft, soluble and nominally "easily digestible" foods, which are so characteristic of our present civilization, I briefly alluded to the fact that they cause stagnation of the bowels, putrefaction and the poisoning of the system. Chronic constipation accompanied by autointoxication is one of the most potent sources of cancer, as Sir Arbuthnot Lane has shown so convincingly in many of his writings, extracts from which were given in Chapters VII and VIII. In the present chapter I would like to consider more fully the lamentable condition of the bowels of civilized men and the reasons why, as Sir T. Lauder Brunton told us, "constipation is so common that it may almost be looked upon as the normal condition in civilized countries."

Among the causes of constipation, I would mention in the first place the wretched habit of eliminating from civilized food everything that is not nourishing and soluble. That eminent physician,

Sir Lauder Brunton, wrote on page 13 of the excellent work *A System of Diet and Dietetics,* edited by Dr. G. A. Sutherland, London, 1906, under the heading "Constipation":—

"The fact that cooking is so common and that the hard parts of the food which would stimulate the intestine mechanically are softened and deprived of their irritating powers, tends to render the movement of the bowel more sluggish, and civilized peoples are very apt to suffer from constipation. I think one may safely say that more than half of the inhabitants of this country require a certain amount of aid to the action of the bowels. This may be afforded by taking more or less indigestible articles of food in the dietary, so that the whole cannot be absorbed but must pass through the intestines and be evacuated.

"In the long practice I had at St. Bartholomew's Hospital, I found that a fortnight was by no means an uncommon period for patients to go without an evacuation of the bowels. Many of these lived upon a dietary consisting chiefly of white bread, butter and tea, which, of course, left very little residue. But the intestine is not merely an absorbing viscus, it also excretes, and some of the substances that ought to be eliminated by it are apt, in cases of constipation, to undergo absorption and to cause weakness, discomfort and ill-health. For this reason, therefore, it is necessary to have a dietary which is not typically perfect, but contains seeds, husks, or vegetable fibres, and if these do not keep up the peristaltic action sufficiently, they need to be supplemented by excess of sugar, by salts, especially sulphates, or by resins or glucosides having a purgative action. Many people object to the constant use of purgatives and say that their employment is not natural, totally forgetting that the necessity for them arises from the unnatural mode of living which the patients lead and the fact of their having well-cooked and soft food from

which all the naturally irritating properties have been removed. ... .

"In the words of Professor Chittenden, 'The best dietary for a healthy man is a mixed diet and not too much of it.' "

The necessity of supplying our bowels with indigestible matter which stimulates their activity is beginning to be recognized by the specialists and by many other people as well. One of the most comprehensive books on constipation is that of Dr. Arthur F. Hurst, *Constipation and Allied Intestinal Disorders.* Dr. Hurst has rightly devoted a large volume to that apparently insignificant complaint. After all, it has the most terrible consequences to mankind, for it is responsible for more than half the diseases and deaths. Dr. Hurst shares Sir Lauder Brunton's opinion that men, like the animals in general, require a considerable amount of indigestible matter with their food. On pages 28, 86 and 92 of the 2nd Edition, published in London in 1919, we read:—

"Fragments of vegetable foods, consisting of indigestible cellulose, together with starch and protein which have escaped digestion owing to their covering of cellulose, are the most important of the articles of diet which mechanically stimulate the intestinal movements. . . .

"The extreme importance of the mechanical stimulation of the intestines is seen in herbivora, which die if they are given insufficient cellulose, and in carnivora, which require bones, and corn-eating birds, which require sand and feathers, in order to maintain their intestinal activity. In man, severe constipation results if a diet completely devoid of vegetable food is taken.

"*Insufficient mechanical and chemical excitants of intestinal activity.*—A diet which produces insufficient mechanical and chemical stimulation of intestinal activity is perhaps the most common of all the causes of constipation, and especially of the milder forms which are not accompanied by any unpleasant symptoms. This is largely a result of modern methods of preparing food. Savages, as a rule, merely bruise their grain instead of converting it into a fine powder, and in some cases they mix it with sand or dust before making it into cakes. Civilized people, on the other hand, not only make no addition of indigestible material to the grain, but they frequently remove the greater part of the cellulose from wheat and use little but the completely digestible starch for making bread, cakes and pastry. Wholemeal bread, which is the only form which contains all the valuable cellulose of the wheat, is unfortunately eaten in very small quantities compared with white bread.

"Vegetables and fruit, which contain important chemical stimulants of intestinal activity in addition to cellulose, are generally eaten in sufficient quantity by the richer classes. Poorer people, however, eat comparatively little vegetables except potatoes, and in recent years the popularity of bananas has increased and the consumption of other fruit has somewhat diminished. Though both potatoes and bananas are among the most valuable of the cheap foods so far as nutrition is concerned, the potato is one of the vegetables poorest in cellulose, and the banana differs from all other fruit in having a negligible quantity of indigestible residue. In schools and institutions the importance of green vegetables and fruit is also too often forgotten.

"Moreover, in civilized countries the small quantity of indigestible cellulose which is present in the food is generally softened to such an extent by cooking that it loses much of its value as a mechanical stimulant of intestinal activity. It is mainly to their coarse and imperfectly cooked food that savages owe their comparative immunity

to constipation, and it is mainly to the badly chosen dietary of the poor and the over-refinement in the cooking of the rich that civilized people owe their extreme liability to constipation.

"The constipating effect of tannin is particularly frequent among the poor, who, in addition to eating white bread instead of brown, and potatoes and bananas instead of green vegetables and apples or plums, diminish the irritability of their intestinal mucous membrane by drinking an excess of tea."

Our digestive apparatus and its needs are considered from a higher plane by the biologists, who naturally take a wider view than medical practitioners. That eminent biologist, Sir Arthur Keith, wrote on page 217 of his work *The Engines of the Human Body,* London, 1919, the best popular work on human physiology existing:—

"Our greatest difficulty will always lie in the control and management of the transport system of the great bowel. Every year fortunes are made from the sale of drugs which are supposed to give—and can actually give—a fillip to its transport system. We have seen that the great bowel has its own pulsatile rhythm and its own 'mass-movements.' They are regulated by an elaborate network of nerve fibres and nerve cells placed between the two strata of the muscular coat. The nervous network is linked up with certain exchange centres in the spinal cord. Through these the great bowel may be influenced by events occurring in other, and even distant parts of the body. Unfortunately, the nervous network in the wall of the bowel is exposed to certain products of absorption or of inflammation and may thus be damaged. No doubt its action may also be affected by substances contained in modern beverages—such as the essential condiments of tea and coffee. It is also true that the nervous mechanism is accessible

to certain drugs which can stimulate it to action, but unfortunately an artificial stimulus sooner or later comes to replace the natural one and then assistance becomes a necessity. No drug can supply the place of the natural stimulus.

"For the final discharge of the alimentary contents a simple kind of 'touch-button' mechanism is employed. The act is controlled by an exchange centre established in the lower part of the spinal cord. When the rectum—the final chamber of the intestinal tube—has become loaded by the discharge of a 'mass-movement' a 'call of nature' arises. When the contents of the rectum are forced downwards by a voluntary effort to the vent, certain transmitting stations placed there are touched, messages are automatically dispatched to the controlling centre in the spinal cord, the sphincter which guards the vent is relaxed, while the muscular coat of the rectum is thrown into an expelling contraction. The act is started by an effort of will, but it is conducted and completed by an automatic mechanism. If the machinery breaks down, the fault is most likely to lie in that part which is under the control of the will. If we neglect the signal of uneasiness, if we contract irregular habits, then the rectum ceases to be sensitive to loading and therefore fails to issue warning messages. . . ."

The author, who has made most important discoveries relating to the working of our digestive system and of the mechanism of excretion, rightly points out that we ought to obey necessity and empty our bowels readily when the prompting arises. Exactly as people eat when they are hungry, or demand drink when they are thirsty, they ought to retire without delay when Nature directs them to do so. Frequent disregard is apt to throw the abdominal mechanism out of gear. Sir Arthur Keith is only

too justified in warning us: "If we contract irregular habits then the rectum ceases to be sensitive to loading and therefore fails to issue warning messages."

The subject of defæcation may be an unsavoury one, but it is absolutely necessary to deal with it in some detail in this book. Sir Arthur Keith has shown that the movement of the bowels depends on the will, that regularity is essential. Unfortunately, civilized beings have suppressed their natural needs since the earliest ages. Dr. A. F. Hurst wrote in his interesting book *Constipation and Allied Intestinal Disorders,* on pages 146 and 314:—

"The call to defæcation is habitually disregarded for various reasons, the most frequent of which are ignorance and laziness. Regularity in defæcation should be taught from early infancy. In England this important duty is too often neglected by both mothers and nurses. . . .

"Laziness is a very common cause of dyschezia. A domestic servant, a schoolboy or a business man gets up so late in the morning that there is only time to dress rapidly and have a hurried breakfast before the day's work begins. There is no time to visit the closet after breakfast, or the visit has to be so hurried that the individual has to be satisfied the moment he has passed anything, although there may be a much larger quantity of fæces ready to be evacuated. Sometimes proper use is not made even of the short time spent in the closet, as all the attention is given to a newspaper instead of to emptying the bowels.

"In other cases, the occupations of the day are too few instead of too many; women who have the whole morning before them with nothing of great importance to do, often put off the unpleasant duty until the inclination to defæcate has disappeared. This is particularly likely to occur if they remain in bed for breakfast. These are just the

sort of people who will be unwilling to put down an interesting book or interrupt a conversation if, later in the day, the desire to defæcate returns. Many women and girls, from a false sense of modesty, dislike to leave the room suddenly if the desire is felt at an unusual hour, as they fear that their absence might be associated in the minds of the other people in the room with the unsavory idea of defæcation.

"Defæcation is naturally regarded as an unpleasant necessity. But if the water closet is uncomfortable, particularly if it smells or is dirty, or is very cold in winter, the visit is not merely unpleasant but repulsive, and many people prefer the discomfort and danger of postponing the act as long as possible to visiting the closet under such conditions. The filthy lavatories so often met with in unfrequented districts are responsible for much of the constipation which frequently comes on during a holiday in spite of the greater amount of exercise taken. In country places, where the lavatory is often situated out-of-doors, there is a natural tendency to postpone emptying the bowels in very cold or rainy weather, or when the desire is felt late in the evening or during the night. In many institutions the closets are insufficient in number to meet the demands upon them, so that defæcation has sometimes to be postponed until the desire has considerably waned.

"An attempt should be made every day at the same hour to open the bowels. The best time is immediately after breakfast, as under normal conditions most of the contents of the alimentary canal are then collected in the pelvic colon, and food taken into a completely empty stomach is such a powerful stimulus to intestinal activity that some of the contents of the pelvic colon are propelled into the rectum, where they give rise to the call to defæcation.

"As described in the chapter on the physiology of defæcation, a number of subsidiary factors help to make the early morning the most suitable time for the daily action of the bowels. Among these are a cold bath, the muscular

activity in getting up and dressing, in some people a glass of cold water drunk on rising or a cup of coffee at breakfast, and in others a pipe or a cigar smoked immediately after breakfast or during the act of defæcation. I have known a lady who was in the habit of staying in bed until eleven o'clock, cured of her constipation by forming the habit of getting up for nine o'clock breakfast. Even when the natural stimuli have produced no call to defæcation, the patient should make an attempt, as the increased intra-abdominal pressure produced by the voluntary contraction of the abdominal muscles and diaphragm may force fæces into the rectum and there produce the defæcation reflex.

"In addition to the attempt to defæcate in the early morning, a call felt at any other time of the day should be obeyed at once. If it is not obeyed, the desire rapidly passes away, although the fæces which gave rise to the sensation remain in the rectum. I have already described how this is due to relaxation of the tonic contraction of the rectal wall and how the atonic dilatation which results may be the first step in the production of severe dyschezia.

"It is most important that sufficient time should be spent over the act of defæcation. It is rare that a single effort is sufficient to evacuate all the accumulated fæces."

Unfortunately the foundations of constipation are laid in children when they are quite small. Cow's milk and the various other substitutes for mother's milk are constipating, while mother's milk as a rule stimulates the action of the bowels. Children brought up on cow's milk, infant foods, etc., who are "scientifically" deprived of their mother's milk, the most appropriate food, are only too often given sluggish bowels for life, and matters are made worse for them by the absurd habit of restricting the necessary act of defæcation to a single visit per day.

Man is the only warm-blooded animal with which I am acquainted which carries its putrefying rejections about for a great many hours, and often for days, without any need. A young mother of my acquaintance, whose baby was in the habit of retiring twice per day, was told by all her lady friends that that was quite wrong, quite abnormal, that the child should be taught to go to stool only once a day. We enable our dogs and cats to empty their bowels at least twice a day, but we compel our children to become constipated by teaching them to retire only once. Dr. A. F. Hurst wrote on page 422 of his book previously mentioned:—

"Up to the age of four months the bowels are open from two to four times a day; during the remainder of the first year they are generally opened twice, but in some infants, only once a day. At first, defæcation is a purely reflex act; after the second or third month the infant is gradually educated to defæcate only in response to certain external stimuli, and with the fuller development of intelligence that act comes completely under the control of the will. . . .

"Most frequently constipation in infants is due to a deficiency in the stimulating qualities of the food. Human milk, the natural food of infants, contains two substances which stimulate intestinal movements—fat and lactose. It is unusual for deficiency of either of these to be sufficiently marked to cause constipation, which is therefore rare in breast-fed infants. Undiluted cow's milk contains the same percentage of fat, but only two-thirds of the lactose present in human milk. As it contains more than double the percentage of protein, it is usual to dilute it before giving it to infants, with the result that the amount of lactose and fat present is considerably less than in human milk. Hence constipation occurs very frequently among infants brought up by hand."

The tragi-comedy of unnecessarily suppressing our natural needs and raising a constipated and diseased race is humorously and forcibly described as follows by Dr. Leonard Williams on page 102 of his excellent book *Minor Maladies and their Treatment,* London, 1908:—

"Why it is that civilized man should be a constipated animal is a question that requires answering. And the answer is not, in truth, very far to seek. It is this: Civilized man eats too much, thinks too much and sits too much. Also he uses a water-closet. . . .

"Civilization, not altogether devoid of advantages, is, physiologically, full of drawbacks. The control of the lower centres by the higher is essential to social life; it is the pivot round which the community revolves, and the disgusting act of defæcation is very properly the first to be brought under the iron heel of propriety.

"Very early in the life of the child the control centres are invoked, and defæcation, which in strictest physiology should occur after each meal—that is at least thrice daily —is severely battened down until it reaches the level of a grudging diurnal concession to lower things. Then come social, scholastic, and other exigencies; the control is still further developed, until at length the control attains such complete mastery that the tail restrains the whole dog. That is the foundation; the super-structure erects itself.

"This hypertrophic development of the control mechanism is the cause of all the trouble. In very early days, when the child is still on the level of the *pot de chambre,* he is discouraged from using it too frequently. Then he is promoted to the water-closet, to poise himself on the seat, which is all the more an acrobatic feat to him because his instinct tells him that to fall backwards into that seemingly bottomless pit would be the end of all things. Then come the school days, and the necessity for regulating and still

further controlling the excretory act. Boys are not encouraged to void their excreta and girls are often positively discouraged. 'You must not give way to these feelings; you must learn to control them.' Alas! she proves all too apt a pupil. The control attains not only to mastery, but to despotism; and the healthy clean-skinned adolescent rapidly becomes the sour-smelling and sour-tempered adult.

"If peradventure such a victim of custom and *les convenances* should at this point come in contact with a medical man who has not been impervious to the gospel according to Arbuthnot Lane, he may still find salvation. But even so, with reason and good advice to guide him, in comparison with the savage he finds himself handicapped. Many a time and oft he would like to, but cannot; letting 'I dare not' wait upon 'I would'; and even when he can he is still surrounded by enemies. The chief of these is the modern water-closet.

"Savage man perforce adopts the crouching attitude, normal and necessary to complete emptying of the lower bowel, and he has only to turn round to assure himself that the bowel is indeed empty, that the tribute of the descending colon is really sufficient to lighten the day's work, and that he is, so to speak, a free man. The beneficent psychic effect produced by the sight of a generous stool cannot be over-estimated. It turns a melancholy man into a joyous one; it makes the timid courageous and the lazy energetic. Now, the modern water-closet, for all its sanitary perfection *vis-à-vis* the community is grossly defective *vis-à-vis* the individual, because it deprives him of the mental stimulus of the uplifting vision afforded by the result of his peristaltic labours. Nor is this its only crime. That its fathomless depth should deprive man of the satisfaction of ocular appreciation is bad, but it is almost worse that its height from the ground should paralyse his abdominal muscles. These muscles are little enough exercised by sedentary man, but when seated on the ordinary, every-day water-closet, he could not exercise them even if he would."

Dr. Williams rightly points out that the upright attitude adopted by civilized man "paralyzes his abdominal muscles." It is as unnatural to empty one's bowels sitting bolt upright as to go to sleep in that position. In France, Italy and many other countries far more sensible arrangements, totally unlike the so-called sanitary water-closet, are general. No seat is provided. People squat over a hole in the ground, their feet being placed upon marble steps, and the result is that the act is facilitated, that the bowels are completely emptied. Besides, the absence of seats prevents the spread of various infectious diseases, especially syphilis, which is not infrequently contracted by the use of the so-called "sanitary" toilet. About 10 per cent. of all syphilis cases are supposed to be due to causes apart from sexual intercourse.

We carefully drain our houses and our towns. No man in his senses would live in a badly drained house. However, while we spend a lot of thought upon the drainage of our dwellings, thinking it inconceivable to live in a badly drained house, we utterly neglect the drains of our bodies which are infinitely more important. In the country parts, where there are no house drains and no water-closets, where there is a less rigid convention with regard to the number of times one may retire and where people eat more natural food than in the towns, people grow up healthy and strong. In the towns we have perfect drains to the houses, which matter comparatively little, but most insanitary con-

ditions with regard to the drains of our bodies, which are all-important.

Chronic constipation, caused to a large extent by vitamine starvation, by the faulty food of civilization, by conventions which cause us to delay and suppress the needs of our bodies, and last, but not least, by the kinks in our bowels discovered by Sir Arbuthnot Lane, which have been described in Chapters VII and VIII, causes our fæces to dry up and harden in the bowel, for the bowel absorbs the liquid. At last the hard accumulations are removed, as a rule, by some drastic remedy. Often the accumulated mass of putrid matter has become so thick and so hard that the tough, leathery skin of the exit is torn. If hard stools of unnaturally large size are able to tear the thick skin of the anus, one can imagine what havoc they will cause to the thin mucous membrane of the bowel, especially in those portions which are constricted by supporting bands which have created kinks.

The vast majority of civilized people are constipated, and probably 90 per cent. of the constipated people find relief by the use of various patent medicines. Every patent-medicine vendor wishes to bring about miracle cures. His object is not to give permanent relief to people suffering with constipation, but to sell his goods. Hence, most of the remedies taken for constipation contain some very irritating drug which acts quickly. In many cases purgatives contain drugs which are a veritable poison to the system.

After being expanded to the utmost by a mass of

putrefying matter, the bowel is lacerated by the sudden propulsion of a thick lump of hard fæces. The gaping wounds formed are poisoned over and over again with the toxic contents of the bowel and in addition are irritated and inflamed by the violent purgative taken. We cannot wonder that chronic constipation and the habitual taking of purgatives combined lead to auto-intoxication and eventually to cancer in the bowels and elsewhere in the manner described in Chapter VII.

Numerous proofs might be given that constipation relieved by violent remedies leads to serious troubles and eventually to cancer. The matter is so clear that it is scarcely necessary to give examples and quote opinions. I would therefore give only a single extract in support of my contention. Dr. W. M. L. Copin stated in his article "A Basis for the Prevention of Cancer," which was published in the *Journal of the American Medical Association* of the 20th May, 1922:—

"A middle-aged woman of fine physique, apparently in perfect health, negative family and personal history, began to take on fat; disinclined to give up rich foods and more or less sedentary habits, she decided on active purgation. The patient told me that she took from 2 to 4 ounces (60 to 120 grm.) of Epsom or Rochelle salts daily, had taken 'loads' of it, to use her own words—sometimes using cascara and compound cathartic pills as substitutes, or in addition, especially when the scales did not satisfy her desire to reduce. She lost some weight, probably only a few pounds, but was gratified to find the tendency to gain apparently under control; she was abnormally sensitive on the subject of weight and concealed the fact that she was subjecting herself to active, even violent, purgation.

"After several months considerable pain in the lower abdomen appeared, at first mildly annoying, later, at times, severely so; facts as to her general health are not accessible, but some weeks, possibly two or three months, after she last spoke to me concerning her 'reducing' treatment, and somewhere about two years after its inauguration, the patient consulted Dr. Bloodgood in Baltimore. Exploratory incision disclosed an inoperable cancer of the sigmoid.

"Of course, proof of causative relation between the violent purgation and the evolution of the cancer is inconclusive; but surely, knowing, as we do, how frequently rectal irritation, diverticulitis and allied factors precede cancer in these parts, it is no far cry to the assumption that repeated or long-continued, often violent purgation and obstinate constipation, are not without danger."

The body normally defends itself in a most efficient manner against disease which attacks it. The wonderful methods of defence are only partly known to science. Ever new miracles are disclosed to us by the biologists. Healthy people do not readily catch a disease, for the micro-organisms and other factors causing it are defeated and expelled by the marvellous mechanism which Providence has given us. "Cancer," as Sir Arbuthnot Lane has told us, "never attacks a healthy organ or a healthy tissue." The same rule applies to most diseases.

Thoroughly healthy people live to an extreme old age and die painlessly, often in their sleep. In their case the clock of life simply runs down. Such people lead, as a rule, a simple, natural life. They eat plain natural food, they shun drugs and medicines, their digestion acts normally both in assimilating and in expelling, and they daily renew their strength by

spending a good deal of their time in the open air in natural exercise. Good wholesome food, air and exercise are far better remedies than all the drugs known to the chemist and all the cures known to the physician.

Fresh air is as essential to health as wholesome food and an active, easily working bowel. Unfortunately the majority of civilized people are not only starved of vitamines, as has been shown before, but they are also starved of fresh air. Most people keep their bedroom windows closed at night, fearing the night air. Yet the night air is far purer than the air of the day because of the absence of motor traffic and of dust, and the diminished amount of smoke. The air in our towns is contaminated, especially during the day, with soot, dust, and the smell of countless motor-cars, while the life-giving light of the sun is obscured by a pall of smoke. Lack of fresh air and of light lower the resisting power of the body, which falls easily a prey to diseases of every kind, among them cancer.

Modern civilization robs us not only of natural food, fresh air and sunlight, giving us poor artificial substitutes for all three, but it robs us of exercise as well. Walking is becoming a lost art. Instead of using their limbs, men exercise only those muscles on which they sit. The vast majority of us take what is called exercise sitting on motor-cars and omnibuses, sitting in carriages and boats, etc. Our bodies were made for exercise and we cannot keep our health without exercise. The motor-car may prove a powerful factor in lowering the national health, both by

poisoning the air and by causing people to give up walking. I have noticed during railway strikes that young men will rather wait two or three hours for an overcrowded vehicle than walk two or three miles.

Many competent observers have commented on the fact that cancer seems particularly prevalent among sedentary people. The cancer death-rate is far higher among women than among men, not only because women are more inclined towards constipation than men, because they have a larger abdomen than men, because they are more bashful than men and consume more constipating foods, such as sweets, but also because they are less active. They are the sedentary sex. Opulent gentlewomen leading a life of ease are among the most frequent victims of cancer. That has been authoritatively shown in the first chapter. One of the healthiest men I have known was Sir Hermann Weber, the well-known physician, who died ninety-five years old. He attributed his freedom from illness and his vigour chiefly to hard exercise. He died a natural death and, when ninety-five, still walked on an average 50 miles per week. His greatest recreation, as that of the author, were long week-end walks of 20 miles per day and more.

The fact that lack of exercise is a predisposing cause of cancer was pointed out by Drs. Silvertsen and Dahlstrom in their paper "The Relation of Muscular Activity to Carcinoma," published in the *Journal of Cancer Research* in 1921. On page 365 the authors stated:—

"Carcinoma in men, especially retired farmers, has been frequently seen by us in the past few years. These patients, men with large, well-developed bodies of the 'frontiersman' type, usually give a history of having retired from the farm in good health a few years back, to enjoy a well-deserved rest. On the other hand, we have often talked with farmers who, for one reason or another, still shoulder the responsibilities of the farm, who were well and working hard, though 60, 70 or even 80 years of age. This observation brought us to consider muscular activity in relation to carcinoma. . . .

"Muscular activity stimulates metabolism and retards the approach of senescence and decay. The tuberculosis problem has been greatly simplified by the recognition of the value of rest, sunshine, wholesome food and fresh air. We believe that the carcinoma problem may also be simplified by the recognition of the value of muscular activity in those periods of life most affected by carcinoma, those periods of life when we are prone to 'let down' and check our pace. If muscular activity has an intimate relationship to carcinoma, the value of it will be most apparent in prophylaxis, the field which, to date, promises the most in the attack on this malady. . . .

"From a study of carcinoma deaths among males in Minnesota for three years, it appears that the death rate in those who are active is greatly exceeded by the death rate of those who are inactive. From a study of the death rate of those who are actively engaged in a gainful occupation, it appears that the death rate is lowest in those occupations involving the greatest amount of necessary muscular activity, and is highest in those occupations involving the least amounts of muscular activity. The age incidence factor of the cases studied does not explain the variations shown."

Exactly as there are interested people who recommend that we should replace natural foodstuffs by

"scientific" substitutes of very doubtful nature, so there are interested people who urge us to replace natural exercise in the open air by a few minutes spent in gymnastics in our bedroom, by massage, by Turkish baths, etc. Of course, no artificial substitute can replace the natural article. Gymnastics, massage and Turkish baths may keep the body supple and may stimulate perspiration, etc., but they cannot replace a two-hours' sharp walk in the open air, or other natural exercise. The professional providers of substitutes for natural food and natural exercise pander to our appetite and our love of ease and idleness. They exploit our gullibility and ruin our health, while filling their pockets.

It is so obvious that lack of physical exercise predisposes to disease of every kind that no learned proof is required to show that the spread of cancer is favoured not only by vitamine starvation, wrong food and wrong feeding methods, and by the suppression of the desire to empty one's bowels, but also by lack of fresh air, lack of sunlight, and lack of exercise, defects which, quite unnecessarily, accompany modern civilization.

The habit of taking baths has spread very greatly during the last two or three decades. Baths supplying hot and cold water are now to be found in millions of the humbler homes. Cleanliness is certainly a very wholesome habit, but it must be doubted whether the frequent taking of hot baths is beneficial. One can clean the body just as efficiently with cold water and soap and hard rubbing as with hot water and soap.

Hot baths not only enervate and predispose to chills and colds, but they have in addition the unfortunate influence of increasing the tendency towards constipation which afflicts civilized mankind. Physicians will order a hot bath in case of colic. On the other hand, they will order cold baths in case of constipation. A short cold bath followed by a vigorous rubbing down with a hard towel and a short run is one of the best things to create an appetite for breakfast and to stimulate the activity of the bowels.

By following a life of ease, by eating foods which require no chewing, by taking no exercise, by relying on pills, and by indulging in hot baths, we undoubtedly create conditions which are favourable to the development of cancer, and of many other diseases from which primitive peoples are free.

CHAPTER XV

The Test of the Cancer Theory Stated in this Book—Is Cancer Really Caused by Chronic Poisoning and by Vitamine Starvation, or is it Mainly an Infectious and Inheritable Disease?

In the course of this book I have shown by means of a superabundant mass of evidence that cancer is a disease of civilization, that it is caused by vitamine starvation and by chronic poisoning, and that the mistakes made in civilized feeding and certain of our habits favour the development of that terrible disease. Many readers may say: "The case has been put very strongly and very convincingly by the author. His arguments and proofs seem unchallengeable. However, we have seen it stated that cancer is infectious and hereditary, that it favours certain districts and families, that therefore it must be caused by some micro-organism for which scientists are searching. Can the theory that cancer is due to chronic poisoning and to vitamine starvation be reconciled with the theory that the disease is caused by some micro-organism?" That objection to my theory has to be answered, and it will be answered in this chapter.

There are good reasons for laymen believing that

cancer is either infectious or inheritable, or is both infectious and inheritable. Readers of this book may advance the three following arguments against my theory:—

1. Many scientists and doctors who ought to know, believe that cancer is infectious.

2. The existence of cancer families seems to indicate that the disease is inheritable.

3. Many distinguished scientists have spent years in searching for a cancer micro-organism, and they would surely not have done so without good cause.

I shall reply to these three arguments, one by one, although I might answer that it is absolutely unimportant whether cancer is caused by a micro-organism or not, that that question is rather a theoretical question than a practical one.

Prevention is obviously better than cure. The principal thing which we ought to do with regard to cancer is, of course, to prevent it, especially as, apparently, it can be prevented without overmuch difficulty. Moreover, if the disease were caused by a micro-organism, we might never find it, and should we be fortunate enough to discover it, we might not succeed in killing it without killing the patient at the same time. We know the micro-organisms which cause a good many diseases, but in most cases we are unable to destroy them without destroying, at the same time, their human hosts. The tubercle bacillus is a case in point. The discovery has not, as yet, led to the discovery of the hoped-for antidote.

It is quite natural that doctors are haunted by the fear that cancer may be infectious. As I stated

in the first chapter of this book, cancerophobia is widespread, and it is most acute amongst the doctors themselves who witness the horrible sufferings which the disease entails. Naturally they do not wish to take any chances, and they are quite right in their attitude.

Apparently the majority of well-informed observers believe that cancer is not infectious. Dr. W. S. Bainbridge wrote on page 151 of his book, *The Cancer Problem* (The Macmillan Co., 1914):—

"Modern cancer research has yielded no evidence of the communicability of the disease by infection, and much fresh evidence that this is improbable. . . .

"The idea that cancer is infective still finds staunch supporters, even among experimenters themselves, notably Borrel, of the Pasteur Institute; Gaylord, of the New York State Laboratory; and, more recently, Klemperer and C. Lewin, of the Berlin Charite Cancer Department."

The distinguished scientists mentioned by Dr. Bainbridge and various others may be mistaken. I do not wish to criticize their theories in this place. To do so would require a great many pages, and the discussion would only confuse the reader. I therefore would give a few extracts which may seem to settle the point at issue. Dr. F. L. Hoffman wrote in his excellent work, *The Mortality from Cancer throughout the World,* Newark, 1915:—

"Dr. George W. Crile, in his oration on Surgery at the Fifty-ninth Annual Session of the American Medical Association, after reviewing the few spontaneous cancers that have been successfully transplanted from one animal to another of the same species, and after mentioning the fact

that no cancer has as yet been successfully transplanted from one animal species to another species, points out that the surgeon's immunity from cancer infection during cancer operations is practically complete.

"Dr. Willy Meyer, in an address before the Cancer Research Institute, printed in the *Medical Record,* October 11th, 1913, in reply to the question as to whether cancer was infectious or contagious, or both, observes that '*one had never seen nor heard of a patient afflicted with the disease conveying it to his wife. Nor had they ever heard of a nurse caring for a patient with carcinoma for months ever becoming stricken with the disease.* Nor had he ever heard of a surgeon who, for instance, had injured his finger during the performance of some operation on a cancerous subject ever developing cancer. It did, therefore, not appear that cancer could be conveyed from one person to another in this way, and therefore the disease could not be considered infectious.'

"Dr. J. W. Vaughan, in an address on 'Some Modern Ideas of Cancer,' printed in the *Journal of the American Medical Association,* May 7th, 1910, concludes, in regard to contact tumours and direct infection, that 'surgeons have been removing cancers since the time of Hippocrates, and as yet no case of infection from such a source has ever been observed.' Rodman, in an address on Cancer read in the section on Surgery and Anatomy, and printed in the *Journal of the American Medical Association,* Sept. 30th, 1905, remarks that 'the rarity of, if not unheard of, infection of operating surgeons by cancerous patients is the strongest possible evidence against the parasitic nature of the disease.'

"It would serve no purpose to add to the foregoing the available additional evidence from other sources in support of the contention that, in the light of our present knowledge, cancer is not an infectious or contagious, or, in other words, a transmissible disease from person to person by contact, or by other means of germ conveyance."

The assertion of Dr. Willy Meyer before the Cancer Research Institute that "one had never seen nor heard of a patient afflicted with the disease conveying it to his wife, nor had they ever heard of a nurse caring for a patient with carcinoma for months ever becoming stricken with the disease," should greatly comfort all those who have a friend or relative suffering with cancer. Dr. Vaughan's statement that "surgeons have been removing cancers since the time of Hippocrates, and as yet no case of infection from such a source has ever been observed," is equally categorical, and so is Dr. Rodman's statement that "the rarity of, if not unheard of, infection of operating surgeons by cancerous patients is the strongest possible evidence against the parasitic nature of the disease."

The views collected by Dr. Hoffman are powerfully confirmed by the most interesting and important statements given on pages 195 and 197 of Mr. W. Roger Williams' excellent work, *The Natural History of Cancer,* London, 1908. We read on the pages indicated:—

"In opposition to these fanciful conceptions, I can appeal to my eight years' experience at the Middlesex Hospital, where—although I was daily in the cancer wards—I never noticed a single fact that could possibly be construed as evidence of the communicability of malignant disease from one human being to another; but I noticed many indications which seemed clearly to imply that the disease was neither infectious nor contagious.

"At that time, the special wards were packed with patients in advanced stages of cancer, mostly of the breast and uterus, in a state of ulceration. There were no day-

rooms for these patients; they lived and died in the same wards. No sooner was one dead than her place was taken by another. The crowding was great; yet during a period of 20 years, not a single instance is known in which a nursing sister, probationer, nurse, ward-servant, surgeon, student, or anyone engaged in attendance on the cancer patients, ever acquired the disease. The nursing sister in charge held her office for over a quarter of a century, but she was never affected.

"Among these cancer patients were many who had been inadvertently admitted, with various chronic ulcerative affections of a non-cancerous nature, but none of them ever took the disease. . . .

"The attempts made in Paris at the Hospital St. Louis early in the nineteenth century by Alibert, Biett, and others, to inoculate themselves and their pupils with the disease, were uniformly unsuccessful. In modern times, Senn implanted the fresh pulp of a recently removed cancerous gland into the subcutaneous tissue of his forearm, with a negative result; and, in like manner, ended Wickham's attempt to inoculate himself with tissue from a case of 'Paget's disease' of the breast, associated with cancer.

"Notwithstanding the frequency with which surgeons and medical men are exposed to contagion in the ordinary course of their professional duties, not a single authenticated case has been recorded in which the disease was acquired in this way.

"Thousands of persons are habitually engaged in the attendance upon the victims of this disease, but how few have ever been similarly affected. . . .

"Of 134 men with cancer of the penis, tabulated by Demarquay, only one had a wife with uterine cancer. Bossi, who has recently investigated this important subject, has arrived at a similar result; of 180 husbands known to have had marital relations with wives the subjects of uterine cancer, not one ever contracted the disease.

"The comparatively few cases in which cancer of the

uterus and penis have co-existed in husband and wife is so small as to deprive them of all value as evidence of contagion. It accords with this, that cancer of the penis is a rare affection, while uterine cancer is exceedingly common; thus, in 1900, 3,679 women died of uterine cancer in England and Wales; but only 100 men died of cancer of the penis. . . .

"Again, the children of cancerous mothers do not acquire the disease, even when the placenta, uterus, or other part of the genital tract is the seat of the malady. Moreover, mothers with cancer of the breast have often suckled their infants with the diseased organ, without transmitting the malady to their offspring.

"Thus there is every reason to believe that cancer cannot be transmitted from one human being to another, and that it is, in fact, essentially a non-contagious malady."

According to the eminent surgeon quoted, no indication of infection occurred during the 8 years when he worked at the Middlesex Hospital. Attempts of doctors to inoculate themselves with cancer by planting cancerous tissue in their flesh have failed, and Mr. Williams emphatically tells us that no medical men or surgeons are known to have caught the disease in the course of their professional duties. In his words, "not a single well-authenticated instance has been recorded in which the disease has been acquired in this way." That, according to Williams, some nurses have died of cancer is hardly surprising in view of the very heavy percentage of deaths caused by it.

The most remarkable evidence showing that cancer is not infectious is furnished by the British mortality statistics, which seem to establish that the

husband is not likely to contract cancer from the wife if the wife's sexual organs have become cancerous. At the beginning of the seventh chapter I gave a detailed statistical table of all cancer deaths in England and Wales during the 10 years 1911-20, arranged according to sites and taken from the *Statistical Review of the Registrar-General,* 1923. Deaths from cancer of the sexual organs were distributed between men and women as follows during the years mentioned:—

Deaths from cancer of the uterus, vagina, ovaries, etc.	48,475
Deaths from cancer of the penis and scrotum	1,749

The disproportion between the two is extraordinarily great.

While cancer of the female sexual organs is of the greatest frequency, cancer of the penis is of the greatest rarity. From these most noteworthy figures we may justly conclude that Mr. Williams was fully justified in concluding the statement previously given with the words: "There is every reason to believe that cancer cannot be transmitted from one human being to another; and that it is, in fact, essentially a non-contagious malady."

In the absence of any proof to the contrary, it would be not only unscientific, but it would be actually illogical, to assert that cancer is infectious. Besides, if it were infectious, it should infect also primitive men living among cancerous whites. Thousands of cancerous white men live among mil-

lions of non-cancerous negroes in Africa; and the almost non-cancerous Red Indians of North America are surrounded by millions of cancerous whites, and contact between the races is frequent. As primitive natives apparently hardly ever suffer from cancer, unless they adopt the habits of life and the food of white men, we may perhaps safely conclude that there is no micro-organism which causes cancer, or, if there should nevertheless be a cancer-producing micro-organism, that it is powerless to create cancer in men leading a natural life. If the very hypothetical cancer micro-organism is so weak that it is unable to affect primitive men, because their system is fortified against it by the natural lives they lead, we can best overcome the plague by reforming our methods of living, by shunning chronic poisons, and by avoiding vitamine starvation, for we may never discover a cure for the disease.

The belief of many scientists and doctors that cancer is infectious is founded rather on instinctive fear than on fact, and need therefore not be taken too seriously. Instinct and tradition are often wrong. For centuries all the best-informed people and the masses in general believed that malaria, yellow fever, etc., were highly infectious, although they are not.

The argument that cancer is hereditary is far stronger than the argument that it is infectious. Many diseases, such as gout, occur regularly in certain families through many generations, and certain physical phenomena, such as short fingers, deaf-mutism, hemophilia, albinism, cleft-palate, short-

sightedness, etc., are handed on from generation to generation. The Hapsburg jaw and the Hapsburg lip, red hair among the members of the English Percy family, etc., have been characteristic for centuries. Colour-blindness likewise passes frequently from father to son, and susceptibility to certain diseases is frequently hereditary. It seems therefore at first sight quite conceivable that cancer might belong to the hereditary diseases. Dr. H. Gideon Wells stated in an article, "The Influence of Heredity on the Occurrence of Cancer," published in the *Journal of the American Medical Association* on the 22nd September, 1923:—

"Perhaps the most reliable family records of cancer in the literature are those reported by Warthin, which have the virtue of being based on histologic examination in at least many of the cases, and in being collected in a university hospital population probably with better information as to family history than is likely to be the case in large city hospitals with a foreign-born clientele. He cites with diagrams several families in which a striking history of cancer was obtained. In one, of 48 descendants of a cancerous grandfather, 17 had died or been operated on for cancer, and many of the survivors were below the usual cancer age when the paper was published. The preponderance of carcinoma of the uterus (10 cases) and of the stomach (7 cases) is striking. Another family, in which the father and mother escaped cancer although each had cancerous brothers and sisters, consisted of 3 daughters, all of whom had uterine or ovarian tumours. Especially striking is a family in which a cancerous father and a cancerous mother had 6 children, all of whom died of cancer, as did the only grandchild; that is, of the entire family of 9 members in 3 generations, all died of cancer as did the paternal great-grandfather.

"Warthin thus sums up his study:

"In the histories of cancer cases coming from the State of Michigan and examined at the pathological laboratory of the University, about 15 per cent. show a striking history of multiple family occurrence. When the difficulties of obtaining good histories are considered, this proportion is relatively high, and, on the whole, corresponds fairly closely with the percentage obtained by Williams. We must conclude, then, that a definite and marked susceptibility to carcinoma exists in certain families and family generations. This family tendency is usually most pronounced when there is a history of cancer in both paternal and maternal lines. In such families, there is an especial tendency for carcinoma to appear at an earlier age than in the forbears, and in these younger individuals the cancer usually shows an increased malignancy."

Apparently many facts available indicate that cancer is indeed hereditary. That impression is greatly strengthened when we are told that Napoleon I, his brother Lucien, his sisters Pauline and Caroline, and his father, all died of cancer of the stomach.

At first sight incidents such as these can be explained only by heredity. If we look a little more closely into the position, the strength of the evidence in favour of the heredity of cancer tends to vanish. Napoleon was notorious for gulping down his dinner in a few minutes, eating and drinking things when boiling hot. I am not acquainted with the habits of his father, his brother, and his two sisters, who are supposed to have likewise died of cancer of the stomach, but it is quite conceivable that Napoleon's father contracted cancer of the stomach by vora-

ciously swallowing boiling-hot food, and that his children learned that bad habit from him. Cancer-producing habits are as easily inherited as other habits. A friend of mine eats about twenty times as much mustard as do other men, and I should not wonder if eventually he should die of cancer of the stomach. He does so, telling his friends that "mustard is good for the digestion." He has encouraged his children to do likewise, and father and children may, in the end, pay the penalty in the form of cancer of the stomach.

The bad habit of suppressing the natural promptings of the bowels is apt to cause chronic constipation, auto-intoxication, and eventually cancer, which are apt to become "hereditary" because parents teach their children to suppress their needs.

The fact that in certain families a number of people die from cancer is not surprising if we remember that of people of advanced years in England 1 out of every 7 dies of cancer. Now, if 1 out of every 7 dies of that disease, it must inevitably occasionally happen that both husband and wife contract it. The fact of husband and wife both dying of cancer is, of course, greatly enhanced if both lead the same sort of life, if both suffer from chronic poisoning and from vitamine starvation. Dr. James Ewing briefly and correctly stated in his book, *Neoplastic Diseases* (W. B. Saunders Co.), on page 105: "Nothing about cancer is more generally accepted than its heredity nature, and nothing is less satisfactorily proved."

I imagine that cancer may be "infectious" and

"hereditary" much in the same way as is gout. Well-to-do and jolly married people become used to very high living, to the consumption of a large quantity of port, etc. Husband and wife contract gout, and possibly one might say that one party has "infected" the other. Let us assume that the husband always liked good living and that his wife was a pretty school-mistress, a teetotaller, born of poor parents in whose house high living was not known. The husband, desiring to make her strong, induced her to adopt his method of living. She also became inordinately fond of meat, game, port, champagne, etc., and thus husband and wife became victims of gout. The husband probably contracted it 8 or 10 years earlier than the wife, because the latter started high living so much later than the husband. The children born of this jolly couple are, of course, made to live in the same way as the parents, and thus, in due course, gout appears in the children and in the grandchildren. However, one cannot argue from the existence of such a gouty family that gout is infectious and hereditary. I take it that cancer, like gout, is in the main the penalty of wrong living.

If we allow for the hereditary influence of bad habits of feeding and of bad habits of life, it is perfectly natural that cancer, like gout, is to be found in a good many cases in husband and wife and in parents and their children. The very smallness of the percentage of cancer occurring in the children and descendants of cancerous people allows us to conclude that cancer is probably not hereditary, except owing to the bad example set to the children

by those who bring them up. Various authors who have investigated the question whether cancer is hereditary, agree that there is a "hereditary history" only in about 10 per cent. of the cases investigated, a truly insignificant proportion in a conceivably hereditary disease. Dr. J. Bauer wrote on page 80 of his valuable book, *Konstitutionelle Disposition zu Inneren Krankheiten*:—

"The statistical percentage of proved hereditary disposition towards cancer is estimated by many authors at at least 10 per cent., while some give a considerably higher figure. Authorities are mentioned by Wolff, vol. i, page 361, and vol. ii, page 95. Haberlin with regard to Switzerland mentioned 10 per cent. Van Iterson of Holland gives 10 per cent. Another Dutchman, Pel, mentioned 10 to 15 per cent. The Frenchman Menetrier gives 13 per cent., etc."

In Sir William Osler's valuable handbook, *A System of Medicine*, 1915, we read under the heading "Cancer of the Stomach," on page 199, the following with regard to heredity:—

"Opinions vary widely and statistics are very incomplete. In 1,075 cases Snow found heredity in 167, i.e. 15.5 per cent. Of 2,700 cases of gastric cancers, 12 per cent. showed a hereditary history. In the Royal Victory Hospital 24 per cent. gave a probable hereditary history which was undoubted in 18 per cent. Cancer as a family affection perhaps occurs in 10 per cent. in all cases. At the same time, gastric cancer being in any case a frequent disease, there can be little that is reliable in such findings. Just how frequently the offspring of cancerous patients have subsequently developed the disease we do not know, and histories refer to relationships which are often too

remote and indefinite to permit of accurate conclusions. Warthin has recently drawn attention to the marked incidence of cancer in certain families."

In view of the fact that habits of feeding are apt to be hereditary, we cannot be at all surprised that cancer of the stomach shows in about 10 per cent. of the cases a "hereditary history." I have a pronounced love of sweets which I "inherited" from my father, and which he "inherited" from his father.

Cancer of the female breast and of the uterus also runs to some extent in families. The *Journal of the American Medical Association* of the 20th October, 1923, contains an interesting article on the heredity of cancer, in which we read:—

"This article is based on 258 cases of mammary cancer. In 76 of the cases, other members of their families had cancer, 30 families, with a total of 40 cases, having cancer in the breast. The 76 with cancer in other members of the family had 62 relatives with cancer elsewhere than in the breast (including 31 men). Similar data from 274 cases of cancer of the uterus show 66 with cancer in other members of the families. The list included 24 cases of cancer of the uterus among the 42 women. The data of 247 cancers of the skin, 46 of the lips, 69 of the tongue, 89 of the mouth, and 110 of the larynx and pharynx, are tabulated. They demonstrate beyond question a familial predisposition to cancer, site variable, in from 13 to 39 per cent. of these groups, and the predisposition on the part of a certain organ in from 9 to 39 per cent. with the exception of cancers of the lip. Local irritation superposed with familial predisposition brings the familial incidence to 50 per cent. for cancer of the lip. The work issued

from the Netherlands Cancer Research Institute cites Maud Slye's and Roger Williams' publications as confirming the importance of heredity and organic predisposition in malignant disease.

"Williams found heredity in 28.2 per cent. of 136 cases of mammary cancer, and in 19.7 per cent. of 142 cases of uterine cancer. The predisposition of the organs was 39 per cent. for the breast and 34 per cent. for the uterus. These figures are strikingly concordant with those given in the table here, 39 per cent. for the breast and 36 per cent. for the uterus. This same predisposition of one organ is evident in statistics published in various countries, as in Manichou's family, with 69 cancer cases, of which 57 were in the stomach; Kortweg's mother, daughter and grandchild with mammary cancer; Paget's family with cancer of the uterus; and Warren's with cancer of the penis in three successive generations. By calculating the presumable incidence in a predisposed family, the results work out about the same as if heredity alone were responsible for the incidence. Maud Slye's research has apparently determined that cancer heredity is a recessive quality. Consequently, we will always find less evidences of heredity than actually exist."

It will be noticed that the author believes that "heredity in cancer" accounts for 20 per cent., 30 per cent. and more of the cases occurring. It is, of course, obvious that a disease which kills 1 in 7 of the people of advanced years should normally kill 4 people belonging to a family of 28 members of the fatal age, and it might easily kill 5 or 6 out of the 28 without the presumed hereditary factor coming into play. If in a pugnacious tribe of natives one-seventh of the grown-up inhabitants should get an eye knocked out, there would undoubtedly be cases in which grandfather, father, and several of the chil-

dren had apparently "inherited" the loss of one eye. Besides, it must be remembered that statisticians who wish to discover support for a theory can, as a rule, find more or less exceptional figures which seem to bear out their contention. They need only select a number of exceptional instances and overlook all the others. Without any intellectual dishonesty, statisticians not infrequently fall a prey to their preconceived notions.

In his valuable book, *The Diseases of the Breast*, Dr. Willmott H. Evans, Consulting Surgeon to the Royal Free Hospital, London, 1923, stated on page 261, with regard to the heredity of breast cancer:—

"My own opinion is this. In the vast majority of cases heredity has had nothing to do with the appearance of the disease, but there may be a little predisposition, or diminished resistance, to malignant disease in some families. This predisposition, or lessened resistance, if it exists, is, however, extremely slight, and when we become fully acquainted with the etiology of malignant disease, we shall be able to explain at least most of the apparent instances of it in some other way.

"There are, moreover, curious histories of families in which there has been no record of previous malignant disease, yet several members have died from one or other form of cancer.

"A. Roper has recorded a case in which a husband and wife had no trace of cancer in the history of either of their families, and yet 6 of their 7 children died of malignant disease, the women dying from cancer of the breast. Here it certainly seems as if there were some important factor other than heredity, but in the present state of our knowledge of the cause of cancer we cannot with any certainty explain the matter."

Dr. Evans rightly points out that "predisposition, or diminished resistance, to malignant disease," may run in certain families. A predisposition to very heavy consumption of sugar and confectionery, a predisposition for chemically preserved food, a predisposition to shun raw vegetables and fruit, lead to chronic constipation and to chronic poisoning. Now if, in addition, there should be an inherited predisposition against exercise and fresh air, the power of resistance would be still further weakened. In a family where such predispositions occur, and there are many such families, there will undoubtedly be also a predisposition to cancer. Parents, children and grandchildren, inheriting these disastrous predispositions for wrong living, will probably die of cancer in exceptional numbers, and some investigators will see in their deaths either a clear proof that cancer is hereditary, or that there is an inherited disposition for cancer, although there may be neither.

Towards the end of the quotation from an article in the *Journal of the Medical Association* of the 20th October, 1923, which has just been given, there is a reference to Maud Slye's researches relating to cancer heredity. The researches of that indefatigable investigator have had a considerable influence upon scientific opinion. The results of that investigation, which has gone on now for more than 12 years, were summed up by Dr. Gideon Wells in an article, "The Influence of Heredity on the Occurrence of Cancer," which appeared in the *Journal of the American Medical Association* of the 29th Sep-

tember, 1923. I hope that my readers will have the patience to read through the following lengthy extract from the article mentioned:—

"A most extensive and carefully controlled investigation on the influence of heredity in the incidence of tumours in mice has been conducted by Maud Slye under the auspices of the Otho S. A. Sprague Memorial Institute. This work has continued for more than 12 years. . . .

"Up to the present time, more than 40,000 mice have been examined post-mortem, and all lesions that might possibly be cancer, or concerning which there was any doubt whatever, have been examined microscopically by Miss Harriet Holmes and myself. . . .

"All told, there have been at least 5,000 spontaneous tumours, mostly malignant, observed in this stock; and as all the mice, whether evidently cancerous or not, have been submitted to necropsy, the material is adequate in amount and quality to furnish evidence against which the question of chance or inadequate controls cannot be raised. Were it not that every dead mouse is thus thoroughly investigated, and that the average age at death is, for a mouse community, very high, there would not be nearly so much cancer material. Out of this work many facts have come and much has been learnt concerning the influence of heredity, not only on the occurrence of cancer, but also on its behaviour. Some of the outstanding results are the following:

"1. Cancer in mice appears in most of the forms seen in men and in far greater variety than had previously been supposed.

"2. The tendency to develop cancer, or the capacity to resist cancer, is unquestionably influenced by heredity. Strains have been established in which, among many hundreds of individuals, through as long a period of observation as 25 or 30 generations, not a single case of tumour growth has been seen. Also strains have been established

in which the occurrence of cancer is so common that it becomes the sole cause of the natural death of the animals.

"3. The resistance to cancer in these mice behaves in breeding, in Slye's experience, like a typical Mendelian dominant character. The susceptibility to cancer behaves as Mendelian recessive. When a cancer mouse, derived from the crossing of cancer mice, is crossed with a mouse free from cancer and derived from ancestors that never have shown cancer for many generations, the resulting hybrids of the first generation never show cancer. If such hybrids are bred together or with other hybrids of similar ancestry, cancer will appear in the offspring of Mendelian proportions and strains of (1) pure cancer mice, (2) pure cancer resistant strains, and (3) heterozygous strains.

"This fact has been observed so many times and with such constancy that Slye feels certain that her work establishes her conclusions beyond any doubt. . . .

"Not only the incidence of cancer is influenced by heredity, but also its site and its character. . . .

"(5) Behaviour of tumours is influenced by heredity.

"(6) Inbreeding is not, of itself, responsible for an increased susceptibility to cancer.

"Relation of Animal Experiments to Human Disease.

"As to the bearing of the experimental evidence on the problems of human cancer, the following facts must be considered:

"1. Cancer in animals is, in all essential respects, the same disease as cancer in man.

"2. The laws of heredity are fundamental biologic laws applicable to every living thing, whether plant or animal. Mendel worked out the principles of inheritance with garden peas, and these principles have been found to hold good for all multicellular living things, whether plants or animals, whether peas or mice, insects or cows. This must inevitably be so, since all multicellular creatures take

origin through fertilization of one cell by another, and since the fertilized cell produces quite the same sort of being as the one from which it came. If the laws of heredity established with peas hold good for mice, they could hold for men, for there is far less difference between mice and men than between mice and peas.

"We have, furthermore, found that these Mendelian principles do appear in human inheritance, although as yet we have no completely satisfactory evidence of Mendelian inheritance in human cancer."

Maud Slye and her co-workers have tended, observed, and dissected more than 40,000 mice, and have tabulated all the cases of tumours and of cancer occurring among them, the hereditary incidence of the disease in mouse families from generation to generation, etc., etc. This wonderful investigation is scientifically very interesting, but it seems not very helpful towards the solution of the cancer problem relating to men. Even if the Chicago investigators should in the course of years dissect a million mice and tabulate their findings, we should not know anything more than we do now with regard to the all-important question as to the means whereby we can cure, or prevent, cancer in human beings. Mice and men have different constitutions and react differently to different stimuli.

Towards the end of the long extract given, there are some paragraphs superscribed "Relation of Animal Experiments to Human Disease." The first and basic statement runs: "Cancer in animals is, in all essential respects, the same disease as in man."

Men are not mice and mice are not men. The

leading proposition seems very dubious indeed, and the conclusions based upon it seem as dubious. Those who believe that cancer is hereditary because of the result of Maud Slye's monumental labours are forgetting that there is a difference between animals and men. They are forgetting that a large number of diseases are restricted to men and are never seen in animals, that many other diseases are restricted to animals and unknown to men, while there are others which afflict both men and beasts. The Chicago experiments have, in my opinion, thrown but little, if any, light on the question whether human cancer is hereditary or not.

Those who believe that cancer is hereditary think that some micro-organism is bound to be the factor. My own impression is that there need be no micro-organism, that coincidence does not establish heredity, that it may be doubted whether the disease is hereditary, and that there is practically no hereditary cancer which can be proved to be hereditary.

I would, however, make an exception to the general rule, which is that cancer is caused by chronic poisoning and by vitamine starvation extending over 10, 20, or more years. In a very few cases, young children die of cancer. Most young children who die of what is officially termed "malignant disease," die not of cancer, but of sarcoma, which is entirely different from cancer. The few children who die of true cancer need not have received the disease through microbic action. A great many poisons of a non-microbic kind are apt to poison at the same time the mother and the child in her womb. Lead

poisoning, for instance, poisons simultaneously parent and offspring. Human physiology is still very backward, notwithstanding the advances made by that science. It seems perfectly conceivable that the cancer poison accumulated by a mother in the course of years may concentrate and lead to an outbreak of the disease, not in her breast or her cervix or some other part, but may concentrate in the fruit of her body and bring about cancer in the child when it is 3 or 4 years old, but may spare the mother.

The experience made with beri-beri in the Philippines, described in the beginning of the twelfth chapter, seems to confirm that view. Beri-beri is mainly a deficiency disease caused by eating rice deprived of the outer skin which contains the precious vitamines. Of the breast-fed children born by the vitamine-starved Philippine women, enormous numbers die, partly because their frame seems more seriously affected than that of their mothers, partly because the milk of the mothers is poor in vitamines, partly because their power of resistance is smaller. If, as I contend, cancer is largely a deficiency disease, it is conceivable that chronic poisoning and vitamine starvation may, in certain cases, prove more dangerous to the child than to the mother in accordance with the beri-beri precedent.

I think I have disproved the contention that cancer is infectious and that it is hereditary. There remains the argument against my cancer theory that many distinguished scientists have spent laborious years in searching for a cancer micro-organism, and

that they would surely not have done so without good cause.

Scientists are not infallible. It is only natural that they have looked for a micro-organism in view of the fact that so many diseases are caused in this way. The fashion of attributing every disease to a micro-organism, of searching for that micro-organism and for a poison which will kill the microscopic causer of the disease, but not the patient, has become a craze. Those who believe in ghosts are apt to see ghosts, and scientists specializing in micro-organisms are apt to discover noxious micro-organisms which are not there. In the second chapter it was shown that scientists thought they had isolated the micro-organism responsible for beri-beri in Pekelharing and Winkler's Coccus, in Hamilton Wright's Bacillus, and in Tzuzuki's Coccus. These three micro-organisms were "discovered" and were solemnly isolated and appropriately named. However, it was found that none of the three was responsible for the disease, that beri-beri was caused in the main by the eating of polished rice, and that it could be cured by supplying patients with the outer skin and the germ of the grain which had been polished off.

The attentive reader will notice that I express with the greatest caution my doubt as to there being a cancer-causing micro-organism. I do not categorically deny its existence. My view may be mistaken. However, if there should be a cancer-creating organism, it cannot be the principal cause of the disease.

Otherwise it would spread from cancerous civilized people to the non-cancerous, or almost non-cancerous, primitive tribes.

I am inclined to doubt that there is a cancer-causing micro-organism, because the disease seems to be neither infectious nor hereditary in the ordinary sense. However, I think it quite possible that there may be some particular micro-organism connected with cancer. It is possible that certain micro-organisms might flourish in cancer-infected areas rather than anywhere else, and if such micro-organisms should be discovered, it would rather seem that cancer had given rise to certain micro-organisms than that certain micro-organisms had caused cancer, which is obviously brought about principally, if not altogether, by wrong living. That fact is so obvious that one need not look for a microbe causing the disease. One might as well look for a gout micro-organism in people who suffer from that malady owing to chronic over-indulgence in over-rich food and drink.

Even if a cancer-creating micro-organism should be discovered, we might not be able to cure cancer. The problem of killing the cancer-producing factor without killing or injuring its host might prove insoluble. Only in a few cases have we been able to destroy the harmful microbe without bringing about the death of the patient. Besides, a great many micro-organisms have proved elusive to the scientists. Since Jenner's time we know how to prevent smallpox. We are quite certain that the disease is caused by a micro-organism, but no one has as yet

isolated it. We fight smallpox very successfully, but we fight it not scientifically. We fight it empirically. Without knowing the precise micro-organisms which cause yellow fever and malaria, men learned to eliminate yellow fever and malaria by destroying the mosquitoes which are the hosts of these disease-bearers. The elimination of chronic poisoning and of vitamine starvation may prove as effective against cancer as is the destruction of the harmful mosquitoes against yellow fever and malaria.

Scientists are encouraged to look for a micro-organism in the hope of being able to find both the cause and the antidote. They have succeeded in finding both the microbic cause and the antidote only in a very few cases. The failures have been many and the successes very few. Under these circumstances, it seems perfectly clear that scientists had better study prevention than cure in the case of cancer. As primitive races leading primitive lives are practically cancer-free, it should be comparatively easy to eliminate from civilized life those factors which are responsible for the disease.

Although I believe that there is probably no cancer-causing micro-organism, a statement which I qualify by saying that if, nevertheless, there should be a cancer-micro-organism, it would be not the major cause of the disease, but only a minor cause, the principal cause being chronic poisoning and vitamine starvation, I am not incautious enough to assert categorically that cancer is neither hereditary nor infectious. It is unwise to take unnecessary risks. Until we know with absolute certainty that

cancer is neither infectious nor hereditary, it will be wise to observe due caution. Over-caution can do no harm. Especially will it be wise to observe every care in the case of cancer patients who have festering open sores from which matter oozes. I also think that the children and grandchildren of cancer sufferers should be particularly careful in avoiding chronic poisoning and vitamine starvation, because, after all, they might have inherited a tendency towards that disease, or at least a diminished resistance to its onslaught.

I am afraid that scientists have lost their way. Thousands of industrious investigators are studying cancer in mice, rats, rabbits, birds, fishes, trees, and so forth. Unfortunately, the facts discovered by them seem to have little bearing on the problem in hand. Some of the wisest and of the most enlightened medical men and scientists living have regretfully admitted that our knowledge of cancer is where it was two thousand years ago. They despair of science finding a remedy. Their views have been given in the second chapter of this book. As science has failed in curing the disease, and as science may never succeed in finding a cure, investigators should concentrate upon the relatively easy problem of prevention. This book may show them the way.

I think my theory relating to the causation of cancer cannot be successfully challenged by those who hold that the disease is caused by some micro-organism. I hope to have made this clear in the present chapter.

CHAPTER XVI

The Test of the Cancer Theory Stated in this Book—If the Cancer Theory Put Forward is Right, it should Solve All the Mysteries of that Disease

The doctrine put forward in this book that cancer is caused by chronic poisoning and by vitamine starvation will, I am sure, be challenged, and I welcome its being challenged. I think I have successfully shown in the previous chapter that the disease is probably neither infectious nor hereditary. However, even if an organism, or some other cancer-producing material, should be discovered, and I admit the possibility, it does not follow that the discovery will enable us to eradicate the disease. The discovery of the tubercle bacillus has not enabled us to eradicate consumption. Critics of my theory may object that it seems plausible as far as they can see, but that its soundness must be questioned unless it can explain the numerous mysteries connected with the disease.

The mystery of cancer has bewildered and distracted investigators throughout the ages. That may be seen from the first chapter, entitled "The Horror and the Mystery of Cancer." Let us now see whether my cancer theory will solve the numer-

ous and apparently irreconcilable phenomena connected with the disease which are the despair of all enquirers.

In the first chapter I have quoted several investigators who have shown by most painstaking researches that cancer is particularly frequent in low-lying, marshy ground exposed to inundation. But soon after the theory that cancer was caused by something in the ground of low-lying valleys had been put forward, it was discovered that there was an exceptionally high cancer death-rate in bracing mountainous countries, such as Switzerland, Scotland, Sweden, Norway, and Bavaria. As stated at the end of the fourth chapter, the cancer mortality is greatest in the following countries, according to the statistics given on page 225 of Dr. F. L. Hoffman's excellent book, *The Mortality from Cancer throughout the World,* Newark, 1915:—

STATISTICS OF CANCER MORTALITY, 1908–12

	Number of Deaths	Rate per 100,000 Population
Switzerland	23,228	124.3
Holland	31,375	106.4
Scotland	24,399	103.0
Sweden	5,470	98.3
England and Wales	174,602	97.6
Norway	11,461	95.6
Germany	277,710	87.1
Ireland	17,796	81.2

Measured by the cancer death-rate, Switzerland is at the top of the list, while Holland stands second.

Holland, which consists mostly of low-lying, marshy land of which a large portion lies below the level of the sea, has indeed a very high cancer mortality. However, that of Switzerland is vastly greater. Similarly, the cancer mortality in bracing Scotland is considerably higher than that in relaxing England, where the population lives chiefly in damp river valleys.

My theory easily accounts for the extraordinary discrepancies shown in the table. These discrepancies are explained by the doctrine that cancer is caused by chronic poisoning and by vitamine starvation. In damp and relaxing districts, people suffer far more from constipation than in dry and bracing ones. Hence the people in England and in Holland are subject to cancer arising from internal poisoning, from chronic constipation which leads to auto-intoxication and to degenerative changes culminating in cancer, as shown in Chapter VII. Moreover, in low-lying, damp countries, such as England and Holland, milk, meat, and other perishable provisions go bad far more readily than where the air is dry and bracing. Consequently, distributors in damp and marshy districts are apt to add an extra dose of poisonous preservatives to their goods. The effect of poisonous preservatives upon the health of the people has been fully dealt with in Chapter XI of this book. I have more than once surprised butchers rubbing handfuls of chemicals into the meat. Dr. W. G. Savage, the eminent authority, wrote in his book, *Food Poisoning,* London, 1920:—

"In a sample of brawn, the writer found as much as 96

grains per pound of boric acid, and when the brawn-maker was invited to explain why he used a quantity so vastly in excess of the need, he stated that he thought it was rather hot weather, so he took a small handful and mixed it in with the batch. He evidently thought it could be used like common salt."

Although low-lying lands like Holland and England have an extremely high cancer mortality, that of bracing countries, such as Switzerland, Scotland, and Sweden, is higher. The reason is perfectly obvious. The high mountainous countries have very long winters. They produce rather herbage for animals than fresh greenstuff and fruit for men. Hence the Swiss, the Scotch, and the Swedes get vitamine-starved through the lack of fresh greenstuff and fresh fruit. The long winter compels them to put by large quantities of provisions. These are, to a large extent, protected against putrefaction by chemical poisons, called preservatives, which are obtainable in every village shop. Thus chronic poisoning is brought about.

Countries where high mountains abound, such as Switzerland, Scotland, and Sweden, are very cold. Men returning from the icy blast outside are apt to warm themselves with piping hot drinks. The frequent taking of these is apt to lead to cancer of the throat, of the œsophagus, the passage leading to the stomach, and of the stomach itself, as has been shown towards the end of Chapter XIII, dealing with the defects of modern food and of modern feeding. Under these circumstances, we cannot wonder

that cancer of the stomach is particularly prevalent in very cold countries.

The figures given show that the cancer mortality is considerably heavier in England and Wales and in Scotland than it is in Ireland. This seems all the more surprising in view of the fact that Ireland contains a far larger proportion of old people than England or Scotland. For many years the young people of Ireland have emigrated in vast numbers. Since the middle of last century, Ireland's population has shrunk by one-half. Besides, Ireland is famous for the longevity of the people. Consequently the proportion of people of the cancer age is very much greater in Ireland than in the other parts of the United Kingdom: However, the Irish are an agricultural and a somewhat backward race. Vitamine starvation is less prevalent in Ireland than in England, Wales, and Scotland, because the people consume plenty of fresh milk, locally produced, to which no chemicals have been added, and plenty of greenstuff. As they do not eat much meat, they absorb a relatively small proportion of chemical poisons, called preservatives. There is obviously less chemical poisoning and less vitamine starvation in Ireland than in the other parts of the United Kingdom.

Dr. F. L. Hoffman and other statisticians have drawn attention to the fact that for some obscure reason the cancer mortality increases towards the Poles and diminishes towards the Equator. There is a considerably greater mortality in Scotland than in England, a considerably greater cancer mortality

in the northern portions of the United States than in the southern portions, a much higher cancer death-rate in Argentina than in Brazil, etc.

That apparently inexplicable phenomenon is readily understood by those who have attentively read this book and have grasped its simple teaching that cancer is due to chronic poisoning and to vitamine starvation. In hot countries there is a superabundance of greenstuffs and of fruit rich in vitamines all the year round. Animal life abounds, and those abominations of modern life, cold storage meats, tinned fruit, tinned meats, dried vegetables, etc., are little known. Fresh foods undefiled by chemical poisons are universally consumed. Vitamine starvation and chronic poisoning through preservatives and other chemicals are little in evidence. The generous consumption of vitamines keeps the alimentary tract in order, and the abundance of fruit and greenstuff eaten makes constipation rare. Moreover, in the absence of modern hygienic arrangements, people empty their bowels very largely in a primitive manner, squatting down, an attitude which favours the expulsion of toxic matter. Lastly, people in hot countries feel disinclined to eat and drink very hot food, and thus avoid cancer from chronic burns.

Those who believe that cancer is infectious point to the fact that there are cancer districts, cancer towns, cancer villages, cancer families, and cancer houses. Some medical statisticians have industriously compiled figures showing that there are indeed cancer districts, cancer families, etc., while their

opponents have tried to discredit their statements and their figures. After careful examination of all the material available, I have come to the conclusion that there are indeed cancer districts, cancer towns, cancer villages, and cancer families, but my theory readily explains their existence.

The more opulent towns show the highest cancer death-rate. The well-to-do inhabitants of these rich towns feed "scientifically." They carefully shun all the foodstuffs containing indigestible residue. They become very constipated. They damage their alimentary canal in the manner described in the ninth chapter. They increase the mischief by the free use of irritant pills and medicines, and poison their system by the chronic absorption of putrid matter from the bowels. The result of this folly has been described in various chapters of this book. Besides, the wealthiest towns are the greatest consumers of sugar in every form, and the abuse of sugar, a material which contains no vitamines and leaves no residue, favours the growth in the human body of the poisonous streptococci, as has been shown in Chapter XIII.

Cancer districts and cancer villages may be created by local food customs, such as the abuse of chemical preservatives. A wretched butcher introduces the habit of keeping meat fresh by the liberal application of poisonous chemicals. His assistants start businesses of their own and act in the same manner. Thus a local trade custom favouring cancer is created.

In certain families a hereditary disposition to-

wards cancer is created by the hereditary abuse of sugar or of preservatives, by a hereditary disinclination to eat raw fruit and vegetables, by the hereditary habit of suppressing one's physical needs, etc., as shown in the preceding chapter. Here, as everywhere else, the doctrine of chronic poisoning and of vitamine starvation explains the apparently inexplicable.

Most investigators are puzzled by the fact that almost everywhere cancer deaths are far more frequent among women than among men. Japan is an outstanding exception, for in that country the death-rate is equally great in both sexes. Women are the more constipated sex. Their abdomens, which are built to afford room for the growing baby, give far more space for the accumulation of fæces. Besides, women, being more bashful than men, far more often repress their needs. In addition, they consume vastly more sweets than men, increasing thereby the toxicity of their system. Lastly, they take less exercise than men, and thereby prevent the elimination of the poisons absorbed from the bowels. The Japanese women are hard-working. They take plenty of exercise, for they do men's work in the fields, and sugar is a luxury in the country. As women are considered as inferiors, sugar and sweets go rather to the men than to the women. We cannot wonder that in Japan the cancer death-rate is approximately equally great in women and in men.

In England the percentage of women dying of cancer is only about 10 per cent. greater than the percentage of men, but in the United States the

percentage of women is about twice as great as the percentage of men. This also is readily explained by the simple doctrine which is the basis of this book. The American women seem to be eating sweets all day long. The consumption of sugar in every form is absolutely fabulous among them. Sweets may be sweet, but the end is often bitter.

In England and Wales the proportion of male deaths to female deaths has changed during the last seventy years in the most extraordinary manner as follows, according to the Government Report, *On the State of the Public Health,* 1923, page 14:—

Annual Mortality from Cancer per Million Living

	Males	Females
1851–60	207	440
1861–70	255	522
1871–80	333	619
1881–90	465	739
1891–1900	639	882
1901–10	784	942
1911–20	936	996

During the period under consideration the female death-rate has a little more than doubled, while the male death-rate has increased considerably more than fourfold. Half a century ago the female cancer death-rate was fully twice as great as the male, but at present the female death-rate is only sightly in excess of the male death-rate. Why has this extraordinary alteration taken place? My theory of chronic poisoning and vitamine starvation readily explains it.

In the course of the last half-century great social changes have occurred in England. Among these changes are the temperance movement and female emancipation. It is a well-known fact that people who like alcohol dislike sweets, and that people who have abandoned intoxicating drink become heavy consumers of sweets. Fifty years ago the men were heavy drinkers of beer, and sugar was principally consumed by the English women. Now Englishmen munch sweets quite as freely as women, beer having been replaced to a large extent by sweet temperance drinks, over-sweet tea, etc. The change in the sugar balance among the sexes bears probably considerable responsibility for the change in the cancer death balance among the sexes.

The emancipation of women has benefited them. Fifty years ago the Englishwoman stayed at home and took no exercise. Now the women, having more leisure, take more exercise than the men, if only in shopping and in going after their amusements, while the men sit about in stuffy offices and workrooms and factories.

The variations in the cancer death-rate of different callings is very striking. In the rather out-of-date occupational statistics usually given, the chimney-sweeps stand foremost. Their liability to cancer is due to the poisons emanating from the soot. The cancer death-rate is also very high among hotelkeepers, innkeepers, etc., and alcohol has been blamed for it. I would rather attribute the high cancer mortality of these people to the fact that they attend at the bar during a great many hours, get

very tired standing about, and take practically no exercise in the fresh air. Consequently, constipation and other intestinal troubles are very frequent among them. They have little opportunity for eliminating the poisons absorbed from their bowels, and chronic poisoning leads to cancer.

It has been shown in the first chapter that the cancer mortality is particularly heavy among the hygienically living. That fact seems quite inexplicable. However, it is easily explained by the theory that cancer is due to chronic poisoning and to vitamine starvation. People who live hygienically are scrupulously clean as regards their bodies, clothes, etc. Frequently they suffer from microbophobia. Hence many of them shun raw fruit and raw vegetables. Everything they eat is boiled to destroy the feared disease germs. I know some health faddists who not only never touch raw fruits and salads, but who even refuse to drink water unless it has been boiled. Besides, they lavishly use germicides and disinfectants outwardly and inwardly. These people not only starve themselves of vitamines, but, in endeavouring to destroy harmful micro-organisms, destroy the beneficial and the necessary ones as well, and thus gravely weaken their power of resistance. These sanitarians suffer nearly invariably from chronic constipation owing to the diet which they have adopted. Hence they are victims of chronic auto-intoxication. We cannot wonder that an unduly large percentage of those who are haunted by the fear of disease germs fall victims to cancer.

In the first chapter it has been shown that cancer

singles out the well-to-do. The reason is obvious to those who have followed the argument of this book. The well-to-do endeavour to live hygienically, which means that they starve themselves of vitamines. Besides, they favour the more expensive, which means the more refined, foods, the foods which have no residue. Only the finest flour, which means flour from which every particle of the invaluable outside layer has been eliminated, is used in their bread and cake. They eat the choicest meat which contains no rejections, the softest vegetables which have no fibre, the softest fruits, etc. Consequently the rich suffer particularly severely from stagnation of the bowels, from auto-intoxication, and from all the evils which spring from it and which culminate in cancer. We cannot be surprised that a very heavy percentage of rich people die from cancer.

Various authorities quoted in the opening chapter of this book have asserted that the ravages of cancer are particularly noteworthy among men and women above the average weight. This fact has caused numerous investigators to proclaim that cancer is due to over-feeding, that only a sparse diet will save us from the dread disease. I believe that that assertion is quite erroneous. The primitive races, among which cancer is practically unknown, as has been shown in the third chapter, which is devoted to this subject, are by no means moderate eaters. Some of the tribes which do not suffer from cancer gorge themselves habitually. However, the natives who eat quantities of food which amaze Europeans, fill themselves not with "digestible,"

which means refined and wholly soluble, foods, with foods which lead to intestinal stagnation and auto-intoxication, but with rough and coarse foods. The heavy civilized eaters become heavy because they live on smooth concentrated foods, such as meat, fine flour, fat, butter, cheese, eggs, etc. Hence they become victims of auto-intoxication, which so often leads to cancer.

Stoutness and over-feeding in themselves are scarcely predisposing causes of the disease. Among the races which do not suffer from cancer, there is a considerable percentage of stout and very stout men and women. In certain portions of Africa, for instance, the lazy natives possess enormous appetites and become tremendously fat. Yet they are not visited by that disease which is essentially a disease of civilization.

Mr. F. A. Rollo Russell, as quoted in the first chapter, has told us that in prisons, asylums, and other public institutions cancer deaths are comparatively rare. Many observers have drawn attention to the fact that in Roman Catholic monasteries and convents the inmates arrive at a ripe old age without being much plagued with cancer. As a rule, the low cancer death-rate in institutions of the kind described is attributed to the sparse diet of those who live in them. Many scientists have criticized the views held by Rollo Russell and others, but I think these views are correct.

In my opinion, cancer is caused not by the quantity of food eaten, but almost exclusively by its quality. Cancer, I would repeat, is brought about by chronic

poisoning and by vitamine starvation. The inmates of the great public institutions mentioned probably suffer much less from cancer than the people living around them, because these great institutions are, as a rule, self-supporting. They produce the milk and the meat, the vegetables and the fruit, eaten by the inmates. The milk goes straight from the cowsheds to the consumers on the other side of the yard, and is not fortified against transport by the addition of chemicals. The meat is often very tough, for it is furnished chiefly by the ancient cows belonging to the establishment, but it is wholesome, for it is not protected against putrefaction by the poisonous chemicals which are daily consumed by those who buy their meat at the shop.

The diet of the inmates is composed very largely of self-produced vegetables, and particularly of the cheaper and coarser vegetables. These, like the cheaper and coarser meats, consist largely of insoluble matter which stimulates the peristaltic activity of the bowels. In all the public institutions known to me—I have visited a great many monasteries and convents—a vast quantity of vegetables is eaten in the raw state, such as salads, cucumbers, tomatoes, etc. The consumption of raw fruit is heavy, while sugar is scarce, being treated as a luxury. As the inmates do a good deal of work in the open air, they readily eliminate the poisons which they may have absorbed. It is only natural that people living in these public institutions suffer less from cancer than the people around. Dr. Frank Smithies wrote, not without cause, in his contribution entitled "Diet in

Malignant Disease of the Alimentary Tract," contained in vol. 3 of the work *Dietotherapy*, edited by Dr. W. E. Fitch (Appleton and Co., 1918), page 567:—

"Reliable statistics indicate that the highest cancer incidence is found in those communities where people are well housed, well fed, and free from cares associated with the struggle for existence. Cancer is apparently relatively infrequent where poverty is universal, in prisons, asylums, and poorhouses."

The reason for these anomalies will be obvious to the readers of these pages.

Many people are mystified by the fact that cancer preferably appears in certain sites in men and in women. The reasons for its favouring the alimentary tract have been very fully explained throughout this volume. For some reason, which is as yet not quite clearly understood, certain specific cancers select unusual places. Among these are the chimney-sweeps' and the engine-oilers' cancer of the scrotum, the aniline-workers' cancer of the bladder, etc.

Cancer, as Sir Arbuthnot Lane and others have told us, never attacks a healthy organ or a healthy tissue. That eminent surgeon, Dr. William J. Mayo, stated in the *Annals of Surgery* of June, 1914, in his paper "The Prophylaxis of Cancer," that the disease "in any part of the body which is open to inspection may be shown, in practically every instance, to be preceded by a local lesion." Cancer, like tubercle and the common cold, is apt to attack the weakest spot, the spot where resistance has been reduced.

The reason why it flourishes in gastric ulcers and in the kinks and pockets which are to be found in habitually overfilled and stagnant bowels is perfectly obvious, but it is not so obvious why it should favour the uterus and the breast of women. The uterus is lacerated when a woman gives birth to a child. Thus points of diminished resistance are created. If a woman who has borne children should become chronically poisoned by poisons absorbed from the bowels or by chemical poisons, if, so to say, her whole system should be poisoned, the poison will break out somewhere, and it may concentrate upon the uterus, particularly if, as happens so frequently, laceration of the uterus should be followed by ulceration. Dr. Ilie Vasiliu stated in the *Bulletin de l'Association Française pour l'Etude du Cancer*, page 397:—

"It seems that many authors have clearly shown that the ulceration of the uterus plays a most important part in giving rise to cancer. . . . In the neck of the uterus, ulceration is extremely frequent. . . . To sum up, we find in old ulcers of the uterus frequent changes which clearly indicate pre-cancerous conditions."

Dr. A. Lewis Galabin told us on page 413 of his work, *Diseases of Women* (J. & A. Churchill, 1903):—

"Cancer of the neck of the uterus is a very common disease. It is more frequent even than cancer of the breast, and is the chief cause of the greater prevalence of cancer in the female than in the male sex. It most commonly occurs between the ages of 40 and 50, but a considerable

proportion of cases is also met with between 30 and 40, while a few appear before the age of 30, and others occur even up to advanced old age.

"Cancer of the cervix is extremely rare in virgins and much commoner among parous than among nulliparous women, while among the subjects of it, a considerable number of women are found who have had large families. Thus, in an analysis of 100 consecutive cases by Haultain, there was only one unmarried woman among the number. Seventy women of whose cases the record was sufficiently full for the present purpose, had borne 412 children and had 68 abortions. Thus the average number of pregnancies was about 6.8.

"From this it may be inferred that inflammation of the cervix, induced by parturition or other mechanical causes, plays an important part in the causation of cancer, and that the so-called erosion or granular inflammation near the os, or within the cervical canal, may eventually, in predisposed subjects, go on to malignant degeneration, although in any given case of this common affection, such a termination is an improbable one. . . .

"Laceration of the cervix may thus predispose to cancer by giving rise to inflammatory irritation of the exposed mucous membrane of the cervical canal. I have several times observed cancer supervene upon a chronic laceration, with granular inflammation of the cervix not actively treated; but have never known it to occur after a cervix had been treated by plastic operation. At a very early stage of cancer, it is not uncommon to find evidence of a pre-existing laceration. That constitutional predisposition is also an important element in the origin of cancer of the cervix is shown by the comparative immunity of negroes, though it is not to be inferred from this that the disease may not be purely local at its commencement."

A woman's breast is very frequently the site of cancer because there is a strange connection between

the female bowel and the female breast which is known to many practitioners, but which is as yet unexplained by the scientists. Women who suffer from auto-intoxication consequent upon chronic constipation very frequently suffer from the degeneration of the breast in the very part which is the favourite cancer site, and the cystic and other developments which take place offer a congenial soil to the disease. That has been shown by Sir Arbuthnot Lane and others whom I have quoted in Chapters VII and VIII, which deal with cancer arising through auto-intoxication.

The tongue is frequently attacked by cancer. Death from cancer of the tongue claims about ten times as many victims in men as it does in women, and it has been surmised that this is due to smoking. The disproportion between male and female deaths from cancer of the tongue seems, indeed, to confirm that view. However, primitive races are not attacked by cancer of the tongue, even if they smoke heavily. It may, of course, be that the improved tobaccos of civilized nations contain chemical poisons which are not to be found in the coarser tobaccos smoked by Red Indians, negroes, and others. Cancer of the tongue seems to be rare among smokers unless they are syphilitic. At least, Dr. Wolff stated on page 538, vol. 2, of his huge work, *Die Lehre von der Krebskrankheit*:—

"Cancer of the tongue is particularly frequently seen in consequence of irritation from tobacco-smoking, combined with syphilis. If somebody has had the misfortune to be infected with syphilis, and if, at the same time, he

smokes much tobacco, then the danger of cancer of the tongue is very threatening. Paul Poirer has described cancer of the tongue as being the cancer of syphilitic smokers.''

I am not quite satisfied with that explanation. It is true that syphilis often causes important lesions of the tongue. However, I imagine that a generally cancerous condition, brought about by chronic poisoning and vitamine starvation, is an important additional factor, for cancer of the tongue is very rare among smoking and syphilitic natives who lead a primitive life.

I think that my theory explains all the mysteries and inexplicable contradictions which have hitherto bewildered and confused the investigators.

CHAPTER XVII

How People who are in an Advanced Pre-cancerous Condition may be Saved—An Account of my Personal Experience

I think I have shown convincingly that cancer is caused by chronic poisoning and by vitamine starvation extending over 10, 20, or more years. After having given an overwhelming amount of evidence in support of my contention, I have answered in the last two chapters every criticism which might be advanced against my theory. I have shown that the incubation of cancer takes in most cases a great number of years, and that the disease is favoured by lack of exercise, lack of fresh air, by a faulty diet and its consequences, all of which add to the degeneration produced by the poisons absorbed from the intestine, and prevent their elimination.

An ounce of practice is worth more than a ton of theory. I have experienced in my own body the degeneration which precedes cancer, and I have so far miraculously escaped the disease through a timely change in my habits of life. An account of my experience may possibly save a good many of my readers from the most horrible of all diseases.

Both parents of my father died of cancer. Both of my mother's parents died of arterio-sclerosis, an-

other disease of civilization not unrelated to cancer. If there is anything in the idea that cancer is hereditary, or that there is at least a hereditary predisposition for cancer, there should be a very excellent chance of my having the disease. My father did not suffer from cancer, but, then, he died at a comparatively early age.

I do not believe those have a strong case who pretend that cancer is hereditary, or that there is a pronounced hereditary tendency towards cancer. I have explained my views on the subject in the special chapter dealing with the question whether cancer is infectious or hereditary. However, I believe that there is a strong tendency in children to imitate the bad habits of their parents, bad habits which may be cancer-producing.

My father, like his parents, was excessively fond of sugar and of sweet things, and, like most heavy consumers of sugar, did not care very much for greenstuff, especially raw greenstuff. Naturally he suffered severely from constipation, especially as, in accordance with the prevailing fashion, he tried to keep himself strong by eating things which were wholly soluble and easily digestible, carefully shunning coarse vegetables, brown bread, etc. He tried to keep his bowels open by irritant purgatives, salts, etc. He took practically no open-air exercise.

I imitated my father's faulty habits. I also became inordinately fond of sugar and sweet things, and was encouraged by him to eat them freely. Like my father, I did not pay attention to securing regular evacuations. In fact, I prided myself upon

being able to suppress my need as long as I liked. I was not told of the benefit of fresh air and of adequate exercise. Very soon I became plagued with constipation, and, like my father, I habitually took purgatives.

In course of time I began to suffer from auto-intoxication. My stomach got out of order, and I found it necessary, not only to use purgatives to clear the bowels, but also to take drugs to stimulate the digestion. The perpetual overloading of the colon led, presumably, to the formation of kinks. Hence my constipation became more and more serious. I had to take stronger and ever stronger remedies, and for years I dosed myself with irritant poisonous drugs.

No doubt the hard fæces lacerated my bowels at the points where they were constricted by kinks. The irritating poisons contained in the purgatives made these lesions worse. Constipation dammed back the contents of my intestines. Putrefaction set in, and the putrefying matter entered the blood-stream and was absorbed by the system. Naturally I had a yellow, earthy complexion, and frequently I looked as if I suffered severely from jaundice.

For years I had taken the most potent and the most poisonous purgatives, particularly compound aloin tabuloids, each of which contains one-sixtieth grain of strychnine. The chronic poisoning of the system weakened me increasingly. Feeling weak, I consumed large quantities of poisonously strong tea and coffee, and, in addition to purgatives and digestive medicines, took powerful tonics, among

them large amounts of quinine, pure strychnine on doctor's orders, and various patent medicines. Without them I would not have been able to do my work.

My digestion became worse and worse. I found it impossible to eat brown bread, porridge, raw fruit, coarse vegetables, etc. My food consisted chiefly of white bread, eggs, meat, vegetables boiled for hours into a smooth pap, cooked fruit, etc. Naturally this diet made matters worse, because I became severely starved of vitamines. However, I found it impossible to bear the food which other people ate.

Believing that I ought to keep up my strength, I ate a good deal of lean meat and consumed considerable quantities of soft tinned meats, especially tongue. I continued consuming large amounts of sugar in the form of sweets, chocolate, treacle, honey, tinned fruits, and so forth. I felt too weak to take much exercise. Thus the poisoning of my system was completed. The danger of over-consumption of sugar has been indicated in a previous article.

I discovered that hot things were more digestible than cold or warm ones. So I began to take my food boiling hot, and, on doctor's advice, I sipped tumblerfuls of very hot water early in the morning, late at night, and at odd intervals.

The poison in my system became operative, and I began to suffer from rheumatism and gout. I consulted many doctors and tried numerous cures, and became steadily worse. I took the waters at Carlsbad, Marienbad, Wiesbaden, Buxton, etc. I tried vegetarianism and Fletcherism. I had myself massaged, etc. At last my body started falling off

gradually. I lost about 30 lb. in weight. The inner fat, which props up the stomach, disappeared. The stomach dropped down and became enlarged. I began to suffer agonies of pain and had sleepless nights.

My indigestion became worse and worse. My presence became unpleasant to others. I became disgusting to myself. My eyes and teeth became noticeably weaker. I could no longer take any exercise. A five minutes' walk exhausted me. Occasionally I fainted. I began to suffer from severe colds which I could not shake off, and was afraid to sit on the top of an omnibus in midsummer.

At last my nerves and brain gave way. I suffered from hysteria and melancholy and had crying fits. I feared that I should become insane and wished to commit suicide. I no longer could follow the sense of the printed phrase. At last I was no longer able to sign my name.

Like many people who have cancer or who are about to have cancer, I felt as if I was being poisoned. I had the wall-paper analysed, suspecting that it might contain arsenic. I had, indeed, been poisoned by the deadly material which had been produced in my intestines for more than 20 years. I was spending my days lying on the bed and on the sofa in utmost misery. Life was a burden to me. For years my wife told other people, "My husband is an invalid."

When I had become convinced that I had only a few months to live, a doctor recommended to me the rest cure. I underwent it, having little faith in the

result, but it improved me greatly. The violent poisonous drugs which I had taken habitually were taken away from me. I no longer got overdoses of sugar and very hot food, but natural food. Besides, the horizontal position seemed to straighten out the kinks in the bowels and to relieve chronic constipation. When I left the nursing home I had put on 30 lb. I felt much better, and resolved to try to do henceforth without drugs.

Shortly after leaving the nursing home, I had an attack of appendicitis, which seems to be one of the consequences of chronic constipation. Apparently it is often one of the developments on the road towards cancer. My head was clearer than it had been for years. I thought the matter over and came to the conclusion that vitamine starvation, poison absorbed from my intestines, and lack of exercise had been my undoing. So I resolved to alter my ways. It was clear to me that I was proceeding rapidly on the road towards cancer, that I had thoroughly deserved to have cancer in the lacerated bowels and in the stomach which I had corroded with very hot food, hydrochloric acid taken daily for years and irritant poisons of many kinds.

I began to take regular exercise and gradually extended my week-end walks. I slept with the window wide open and began to introduce gradually natural soft foods and slightly coarse foods followed by coarser foods. I exchanged the enervating and constipating hot bath for the tepid bath, for the cool bath, and at last for the cold bath. I began to try eating peeled raw fruit, and then fruit with the peel.

Then I went on to coarse wholemeal bread, and found that the skin of the baked potato is the best part of the tuber. My indigestion left me completely. Rheumatism and gout disappeared. My oculist told me that my eyes had improved considerably, and my dentist found that my teeth, which had become friable, had turned once more extremely hard as they used to be.

I am 54 years old. I have never been athletic. However, I can now walk longer distances and can walk faster than I ever could in my life. Every week-end I take now a walk of 20 or 25 miles and am quite fresh at the end of it. I can do two or three times as much work as I could do at any time in the past. I feel younger and stronger than I have ever done when I was a victim to constipation and consequent indigestion, etc. I have lost my anæmia and my sallow complexion and have a clear rosy skin and red cheeks. According to all, I look the picture of health. My internal poisons have been eliminated. That fact is attested by my appearance.

Formerly I spent a small fortune on doctors and chemists. I have had no occasion to consult a doctor for my health for years, and the only stuff which I buy at the chemist's is liquid paraffin, about which remedy I shall have something to say in the following chapter. If my bowels do not act as they ought to, I take a glass of lemonade, which suffices to adjust matters. My susceptibility to chills and colds is gone. If I get soaked to the skin and am afterwards exposed to icy draughts in an open car or tram, I merely take a hot bath, and there are no ill conse-

quences. A natural life and natural food can rejuvenate thousands of my readers.

My daily routine is as follows. I get up early and take a cold bath summer and winter. After a rapid ablution and a few plunges in and out of the water, I rub myself down with some extremely hard linen towels until the skin is pink. Then I quickly get into my clothes and set off for a 4-mile walk without an overcoat. Walking at about 4 miles an hour, I return after an hour or so and take my breakfast, during which I have coffee with plenty of milk, coarse wholemeal bread and butter, an egg, some cheese, and some raw fruit or salad.

My luncheon consists, as a rule, of coarse porridge or a few wholemeal biscuits and a cup of coffee or tea. In the afternoon I take tea and a few biscuits. In the evening I dine on meat, a large quantity of vegetables, etc., accompanied by coarse wholemeal bread and plenty of raw fruit or raw salad. Later on I sup on a few raw apples or other raw fruit which is in season. Potatoes I like best baked in their skins, and I eat skins and all.

I endeavour, as far as possible, to live on simple food either unboiled or not overcooked. I shun food containing chemical preservatives and eat little fat and sugar. I am a hearty eater, and if I feel that I have exceeded, I do not take medicine, but abstain from food for 24 hours or 48 hours, while drinking much water, weak tea, etc. Although my mother's parents died of arterio-sclerosis, my arteries are in a perfect condition and my blood-pressure is normal.

I have learned a great deal from a friend of mine

who is 78 years old. Perhaps I ought to say that he is 78 years young. I learned from him the benefit of the daily cold bath and of a 4-mile walk before breakfast. Though he is 78 years, my friend covers on an average 20 miles on foot every day, and I have done with him 25-mile walks. He lives on plain, ordinary food. He avoids sugar in tea and coffee, and dislikes over-sweet things, made-up dishes, game, and so forth. Both he and I smoke heavily, and neither of us is an abstainer. However, we both consume alcohol in very moderate quantities. My friend never goes to the doctor, never takes medicine, and is practically never unwell unless he catches a cold. That is his only trouble. Mentally, he is as fresh and young as he is physically. His memory and his judgment are excellent, and his critical faculties are those of a young man.

Before I corrected my ways I was habitually constipated. I trained myself first to have a daily evacuation after breakfast. Then I thought that two visits a day would be better than one, with the utmost regularity I go now twice a day to that place which I used to visit often only twice a week.

As I have shown in numerous examples given in previous chapters, cancer is the result of vitamine starvation and of chronic poisoning. In Chapter VI I have given many examples which show not only that cancer is brought about by the result of cumulative poisoning which has gone on during 10, 20, or more years, but I have also shown that such chronic poisoning is apt to lead to cancer after an interval of many years during which the individual may be

no longer exposed to poison. For instance, I have shown that aniline workers may suffer from the very characteristic aniline cancer many years after having left the dye-works, that people who have absorbed arsenic during many years may suffer from characteristic arsenic cancer although for years preceding the outbreak no arsenic has entered their system. The various cancer-producing poisons have evidently not only a cumulative effect, but they have a kind of delay action. They set off a kind of time-fuse which brings about the cancer explosion many years after the individual has handled arsenic or aniline, or tar or soot, or X-rays, or any of the known cancer-producers. There may be a similar delay action in the case of intestinal poisoning.

I think I have miraculously escaped cancer so far. For many years I have been in the condition which precedes a cancer outbreak, and I am in the cancer age. Possibly I have staved off cancer only for a time. I am perfectly aware that I am not safe. However, I imagine that if I am allowed to continue living the life I now lead for two or three years longer, if I am allowed to strengthen and re-create my body still further by the lavish consumption of vitamines, by the avoidance of auto-intoxication and by making the best use of the curative force of fresh air, sunlight, and natural exercise, I may succeed in increasing the power of resistance of my body to such an extent that I shall have reason to hope that I shall not become a prey to cancer notwithstanding the many years of chronic poisoning and of vitamine starvation which I have described.

I hope that my readers will read this chapter with earnest attention, that they will take a lesson from my sufferings, and that they will learn from my cure.

CHAPTER XVIII

How Cancer can be Prevented—What Individuals Can Do—What the Research Organizations Can Do—What Benevolent and other Associations Can Do—What Local Authorities and the Government Can Do

In the previous chapters the causation of cancer has been described in full detail, and every statement made has been supported by an overwhelming mass of expert evidence. To those who have carefully read this book it must be absolutely clear that cancer, which abounds in civilized countries, is due to chronic poisoning and to vitamine starvation, and that primitive races do not suffer from that horrible disease.

The poisons responsible for cancer may, perhaps, be called poisons of civilization. However, we need not abolish civilization and become savages if we wish to avoid these poisons and to abolish the disease. By taking certain measures we can, I think, reduce the cancer mortality so very greatly as to convert that plague from one of the most frequent into one of the rarer diseases in accordance with the hope expressed by Sir Arbuthnot Lane in the Introduction.

Those who have attentively read the foregoing

pages know how cancer is caused. They therefore also know how to avoid it. However, it seems worth while summarizing the teaching of this book and pleading for an organized effort for fighting cancer by the only effective means at present available, by preventing its occurrence.

We poison our system quite unnecessarily, largely owing to our self-indulgence, owing to our love of ease, and owing to certain conventions which are ruinous to our health. Among these conventions, the most dangerous is our misplaced modesty and carelessness relating to our evacuations.

We cannot be saved from cancer by the medical profession, or by the research institutes, or by the local and national authorities. To fight cancer successfully, private individuals, organizations of every kind, and the public authorities, must act together. As certain social prejudices have to be overcome, prejudices which have existed since the dawn of civilization, and as very powerful vested interests have to be dealt with, public opinion will prove the most potent factor in bringing about the reforms which are required. Let us then begin by considering what private people can do in order to reduce the cancer mortality to the utmost.

What Individuals Can Do.

I think I have shown convincingly that cancer is caused by wrong living, by the long-continued absorption of bowel poisons, of certain chemical poisons, called preservatives, with which we are

being dosed to an ever-increasing degree, and of various other chemical poisons which are of smaller importance to the great majority of people.

I have shown that, by living on foods from which the most essential elements have been abstracted, civilized men are starved of vitamines, and that vitamine starvation leads not only to ill-health, but to the degeneration of the bowels, to lesions in the intestines, to chronic constipation, and to the chronic poisoning of the system.

Prolonged auto-intoxication produces the most pernicious changes in all the tissues and organs of the body, and is apt to cause cancerous developments either in the digestive tract itself or in those tissues and organs whose power of resistance has been reduced. In those portions of the body where the texture has been weakened or damaged by the poisons circulating in the blood, a comparatively trivial injury, such as a blow on the breast, a kick on the leg, an abrasion, a burn, a scar, etc., may set up cancerous changes. I have shown that people who keep their intestinal canal in a healthy state need not dread every trivial irritation, blow, burn, etc. Such irritations alone do not lead to cancer, for "cancer never attacks a healthy organ or a healthy tissue."

Civilized men were never worse fed than they are at present, when they receive the most tempting foods from the ends of the earth and can obtain fresh fruit all the year round. Our scientific foods, our chemical foods, are a delusion and a snare. Chemists and other scientists cannot improve upon our natural

foods. They can only spoil and ruin them by reducing their bulk, by making them softer, and by making them more pleasant to the tongue and more attractive to the eye. Our feeding methods are utterly wrong.

People who lead normal, natural lives are rarely ill, and they need not fear cancer, which is essentially a disease due to unnatural living. Such people will rarely require the assistance of the doctor and of the chemist. Dr. Robert I. Lee, Professor of Hygiene in Harvard University, rightly stated on page 131 of his work, *Health and Disease: Their Determining Factors,* Boston, 1917: "It is quite possible for a person to go through life without the use of drugs. Good habits of living are far more important than drugs." Civilized men have become drug-sodden and vitamine-starved. They ought to adopt for motto Professor Lee's phrase, "Good habits of living are far more important than drugs." That sentence might fitly be framed and hung up in every bedroom.

Civilized men not only starve themselves of vitamines without any need, preferring "scientific" foods which are robbed of their most valuable elements and which do them harm, to the excellent natural foods available which would keep them in health, but they increase auto-intoxication consequent upon the consumption of soft residueless food deprived of its vitamines by overloading themselves with sugar. The over-consumption of sugar leads to an enormous increase of the poisonous varieties of streptococci and of other harmful organisms

which flourish on sugar and which poison our system.

The taking of over-hot food and drink scorches the stomach and the passage leading to it, and favours cancerous developments.

Men add to their troubles by relieving their usually avoidable constipation by means of irritating and poisonous drugs. Last, but not least, they upset the natural system of expulsion by wilfully retaining and accumulating in their insides poisonous matter which should be ejected without delay.

The absurd convention that evacuation is a shameful act which should be performed stealthily only once a day, the deliberate restraining of the natural impulse to get rid of stagnating and dangerous rejections, has ruined the lives of millions of people. A good evacuation is at least as important as a good meal. Poorly fed people with normal bowels are frequently healthy and strong, while well-fed people with badly acting bowels become victims to diseases of every kind, among them cancer. In suitable places there should be inscribed some legend such as the following:—

Three visits a day
Keep illness away.
Things too sweet and too hot
Cause our insides to rot.

Cancer is a disease of civilization.
It is caused by bowel poisons, chemical poisons, and faked food.
Give Nature a chance.

Civilized people take three meals a day, and every

meal creates the natural impulse in our insides to make room for it by ejecting the useless and often putrefying accumulations. Manufacturers should help the public by providing us with sanitary conveniences which will enable us to attend to our needs squatting, the natural attitude in which alone a complete evacuation can be effected. Sitting bare-skinned on a seat promiscuously used is as unhygienic and as dangerous a habit as eating out of one dish or drinking out of one glass with unknown healthy and diseased people.

The causation of cancer is obvious. The way to avoid the disease is equally obvious.

To avoid cancer, we should carefully avoid chronic poisoning and vitamine starvation.

In order to avoid chronic poisoning, we should first of all avoid constipation. The ancient health rule, "Keep your mouth shut and your bowels open," is an excellent one. We should avoid all chemical food preservatives, all chemical food dyes, and all chemical food flavourings, many of which are irritant poisons, as has been shown in Chapter XI. In addition, we should avoid the various poisons known to be cancer-producers enumerated in Chapter X.

In order to avoid vitamine starvation, we should endeavour to live, as far as possible, on natural, unscientific, and unimproved foods. Scientific improvement of foods leads practically in every case to the destruction of the vitamines contained in them. We should therefore shun over-refined, over-concentrated, over-cooked, and bleached foods.

Patent foods and patent medicines are equally dangerous, and the food faddists' foods should be shunned like the devil.

We should avoid all substitutes for wholesome, natural food, however tempting they may look, however tasty they may be, and however strongly they may be recommended to us as being "highly scientific" by eminent scientists.

We should shun tinned and frozen meat, dried and tinned milk, dried and over-cooked vegetables, tinned soups, dried and bottled eggs, margarine, white bread, polished rice, white sugar, pudding powders, coffee extracts, and fruit drinks and flavourings in bottles, for all these contain chemicals. We should shun meat and dairy produce which has been stored for months and for years in a refrigerator.

While we should avoid denaturalized, embalmed, mummified, and chemically doped foods of every description, we should eat freely honest natural food, such as fresh meat, pure whole milk and butter undefiled by chemicals, fresh eggs, cheese, salads, raw fruits, vegetables not over-cooked and not cooked with soda, wholemeal bread, brown sugar, black treacle, all of which are very rich in vitamines.

It seems to be a law of Nature that the most valuable food elements are contained in the outside, in the skin of the grain, in the skin of fruits, and in the skin of tubers. Unfortunately these are thrown away by civilized nations or are fed to pigs and cattle.

We should avoid using soda in cooking and keep our sugar consumption low.

Those who are unable to eat raw fruit and raw salads, wholemeal bread, etc., because their stomach and their whole alimentary tract has been enfeebled by prolonged vitamine starvation, should strengthen their system by drinking raw fruit juices and raw vegetable juices which are rich in vitamines, which are easily digestible, and which may restore them to health.

Constipation should be avoided, but should not be relieved by purgatives, unless in exceptional circumstances, for all purgatives are irritating, if not poisonous.

Natural foods containing the vitamines belonging to them and a quantity of rough, indigestible matter, such as the husks in wholemeal bread, the skins of fruit, etc., will in most cases relieve chronic constipation, especially if the consumption of these natural foods is accompanied by adequate exercise in the open air. Those who nevertheless remain constipated should endeavour to regulate their system in the first place by those gymnastic exercises which strengthen and stimulate the enfeebled muscles of the abdomen. Self-massage, cold baths, etc., will be helpful, and if these measures should not suffice to regulate matters, sufferers from constipation ought to take refined liquid paraffin three times a day half an hour before meals.

Liquid paraffin is not absorbed by the body, and should therefore do no harm. It is quite tasteless. The only thing objectionable about it is the name. It lubricates the bowel and at the same time softens the stool. Consequently, in the case of kinks of the

bowel, the fæces pass through without straining and lacerating the bowel at the point, or points, where there are constrictions, and where, in consequence of continued irritation and poisoning, cancer readily occurs.

For a long time I had a strong objection to liquid paraffin because I was aware of the existence of paraffin cancer, about which details will be found in Chapters VI and X. However, from careful enquiries which I have made, it appears that many people have taken liquid paraffin for 15 years and longer, and they have nothing but praise for it, and have experienced no ill-effect. It certainly seems to keep many old people alive and in comfort.

With the food and drink which we consume and in the air which we breathe we receive countless germs of disease and poisons of various kinds. If the body is in health, if it functions normally, it can, and usually does, destroy the harmful micro-organisms, and it readily excretes poisonous matter. There is a wonderful mechanism for that special purpose. M. F. D'Hérelle, of the Pasteur Institute, stated on page 84 of his excellent book, *Les Défenses de l'Organisme,* Paris, 1923:—

"The body eliminates poisons by various ways. Poisons are found in the saliva, in the urine, in the perspiration. However, the liver is the principal factor in defending the body against poison. That organ acts as a veritable filter for the blood. It stops and stores most poisons, alkaloids, alcohol, mineral poisons, etc. The latter are eliminated by the bowel. Organic poisons undergo various transformations which change them into less poisonous substances by way of oxidation, hydration, etc.

"These processes, although principally exercised by the liver, are by no means the monopoly of that organ. All cells can act in a similar way. Besredka has shown that the insoluble portions of arsenic were absorbed by leucocytes, the white blood corpuscles."

"Cancer never attacks a healthy organ or a healthy tissue." We are light-starved, air-starved, vitamine-starved, exercise-starved.

Those who wish to avoid that disease should abandon the vicious modern habits of physical idleness. Instead of "taking exercise" rushing about in motor-cars, motor-cycles, and other vehicles, people should walk, ride, swim, engage in sports, practice deep breathing, etc. Our nature requires natural exercise. Exercise substitutes are as undesirable as are food substitutes. Dr. Charles E. de M. Sajous wrote in vol. 2, page 1424, of his excellent work, *Internal Secretions and Principles of Medicine,* Philadelphia, 1922:—

"Out-of-door exercise is of paramount value in the preventive treatment of cancer, to increase the vigour of the circulation in the peripheral vessels and enhance general metabolic activity. Laziness, physical and mental, predisposes to cancer, by promoting circulatory torpor and recession of the blood from the periphery."

Dr. Victor Pauchet told us in his pamphlet, *Le Colon Homicide,* Paris, 1922:—

"If those suffering from auto-intoxication had been taught deep breathing, the large quantities of air taken in by them would have stimulated the activity of the intestines, and might have caused the disappearance of the trouble."

To keep in health, we require wholesome food, a well-working drainage system, fresh air, and exercise. Only by means of these will our nature work. Unfortunately, civilized men live on vitamineless food, they allow their drainage system to be clogged with poisons, they are starved of fresh air and take little or no exercise. We cannot wonder at the consequences.

Natural food, fresh air, and exercise are the best means of keeping the body healthy. By keeping the body healthy we can most easily ward off diseases in general and cancer in particular. In his interesting article, "Cancer: Suggestions and Conclusions Relative to its Prevention," Dr. John Brown wrote in the *Journal of State Medicine* in September, 1923:—

"We know far more now about cancer than we make use of, and Nature is invariably on the side of resistivity, prevention and cure, if given a reasonable chance. . . .

"We all each still have it largely in our power to follow that regimen which makes for a healthy and normal blood-stream which hitherto has been Nature's preventative of cancer, and also in my experience in one or two cases its actual cure. In all this maze of contradictions, let us not forget that natural food, eaten naturally, that is, slowly, taken in reasonable quantity, and proportionate to one's energy output and reasonable demand, makes for a healthy blood-stream. . . .

"Cancer is pre-eminently a disease most associated with the white race, especially when rich foods are persistently taken, the appetite pandered to, when physical exercise is at a discount and the bread is not the product of the 'sweat of the brow.' . . .

"Considering how few foods we ever eat in their natural

form, or as Nature can be said to have intended, the cell change known as cancer is by no means much dissimilar from what one might rationally anticipate, or from those physiological changes which often occur in higher types of life when forced to undergo change of living or feeding conditions. . . .

"Constipatory agencies seem the most common factors I have yet found."

We ought to reform our lives and alter very greatly our methods of bringing up infants and children. However, we need not think that grown-up people and people advanced in years can safely disregard the laws of health which Nature, not the doctor, has established.

Cancer is largely a deficiency disease, a wrong-living disease. Dr. White Robertson, a high authority on the blood and on electro-pathology, informed us in his interesting work, *Studies in Electro-Pathology,* London, 1918, that many of our diseases are due to our mistaken methods of living and to our consuming devitalized foodstuffs. On page 273 of his book he recommended that those suffering from food deficiency and from auto-intoxication following the wrong methods of feeding and living adopted by over-civilized men should be treated as follows:—

"(1) The treatment must aim at the exclusion from the food of all materials which have undergone electrical diffusion changes resulting in the hydrolysis of their lipoids and extinction of their vitamines or enzymes. These are induced by—

"(*a*) Sterilization at high temperatures. Tinned foods.

"(*b*) Sterilization at low temperatures. Ice and cold storage.

"(*c*) Sterilization by salting or pickling, e.g. salt fish, beef, pork, and bacon.

"(*d*) Faulty storage of food in damp places; fermentation.

"(*e*) Stripping of outer covering of starch foods; polished rice, pearl barley, white bread, potatoes boiled after paring.

"(*f*) Faulty cooking; boiled milk, and over-boiled vegetables, meat, etc.; twice-cooked food.

"(*g*) Use of preservatives; formaline, boric acid, salicylates, etc.

"(2) We must insist upon our patients living upon fresh foods of all sorts, and, where these must be supplemented, the use of dried foods which are still vitamine-active."

Very likely a reform in their habits of feeding and of taking exercise, combined with keeping the intestines clean and clear of stagnant material, will stave off cancer in many individuals who would most likely suffer from that disease should they continue their mistaken methods and habits for a few years longer. My own experience, described in the foregoing chapter, shows how vastly the health of a broken-down man of advanced years may be improved by undertaking the necessary change. For people who live a life in accordance with the recommendations given, there is probably little danger of their becoming victims of cancer, unless, of course, they adopt these measures only when it is too late.

Those of my readers who should unhappily develop the disease, need not despair. A timely operation may save them. In my own family I have seen

the benefit of energetic action at an early date. An uncle of mine had cancer of the lip and had it excised. Six months after he developed cancer on the cheek and had the cheek cut out. Both excisions were so neatly mended that there was scarcely a trace left. My uncle lived for a great many years after these operations, and he died in peace, not of cancer, but of some other disease. An aunt of mine, who was operated on for cancer of the breast, also lived for a great many years, and died eventually of a chill.

The necessity of an operation at an early date and the necessity of watching for the appearance of cancer has been pointed out in many documents published by the health authorities in England, America, and elsewhere. I would quote the following leaflet which was issued by the Health Department of the town of Leicester for the information of the inhabitants:—

"It is vitally important that the following facts about cancer should be known.

"It is now an established fact that of the number of persons who die each year from cancer many could have been cured if they had applied earlier for medical advice. On questioning patients as to why they did not apply to a doctor earlier, the reason almost invariably given is that as the early symptoms were unaccompanied by pain, it was not thought that anything serious was the matter. In order, therefore, to call the attention of the public to the significance of certain symptoms and to the vital importance of acting promptly on the occurrence of these, it has been decided to make the following facts public.

"Practically the only cure for cancer at present known

is its early and complete removal. Its destruction by X-rays or radium, though hopeful, is still in the experimental stage. Cancer, if removed early enough, has been proved conclusively to be a curable disease. If neglected, and not dealt with in its earliest stages, it is almost invariably fatal. The paramount importance of its early recognition and early removal is therefore evident. For this purpose, the assistance both of the public and the medical profession is requisite, and a grave responsibility rests on both. It is only by their mutual co-operation that the ravages of this terrible disease can be lessened. The following information is of vital importance to the public. It is no exaggeration to say that, if acted upon, the result would be the saving annually of many lives which at present are sacrificed.

"1. Cancer, in its early and curable stage, may give rise to no pain or feeling of ill-health.

"2. Nevertheless, in the commonest situations, the symptoms of cancer in its early stage are generally manifest.

"3. If any swelling occurs in the breast of a woman, especially after 40 years of age, a medical practitioner should at once be consulted. A large proportion of such swellings are cancer.

"4. If any bleeding, however trivial, occurs *after* the change of life, it generally means cancer, and cancer which is then curable. If neglected till pain occurs, it means cancer which is almost always incurable.

"5. If any irregular bleeding occurs at the change of life, it should always be submitted to a doctor's investigation. It is not the natural method of the onset of the change of life, and in a certain number of cases means commencing cancer.

"6. If any wart or sore occurs spontaneously on the lower lip in a man over 45 years of age, it is almost certainly cancer. If removed at once, the cure is fairly certain; if neglected, the result is inevitably fatal.

"7. If any sore or swelling occurs on the tongue or

inside the mouth in a man after 45 years of age, it should be submitted to medical investigation without a moment's delay. It may be necessary to decide by expert microscopical investigation as to whether it is cancer or not. A very large proportion of such sores or swellings occurring at this time of life are cancer, and if neglected for only a few weeks, the result is too often fatal. If removed at once, the prospect of cure is good.

"8. If any bleeding occurs from the bowels after 45 years of age (often supposed by the public to be 'piles'), it should be investigated at once. A large proportion of such cases are cancer, which at this stage is curable.

"9. When warts, moles, or other growths on the skin are exposed to constant irritation, they should be removed. A large number of them, if neglected, terminate in cancer.

"10. Avoid irritation of the tongue and inside of the cheek by broken jagged teeth, and of the lower lip by clay pipes. Many of these and other local irritations, if neglected, terminate in cancer."

What the Research Organizations Can Do

The public rightly looks to the cancer research organizations for light and leading.

These organizations have, with remarkable industry, studied the scientific side of the cancer problem from every direction. They have made innumerable experiments upon animals and have issued countless learned papers of the highest scientific interest. However, while devoting extraordinary industry and patience to the scientific side of the subject, they have perhaps not given enough attention to the practical, to the common-sense aspect.

They should concentrate upon cancer prevention for a time, and should inform the public how the

body can be defended against the attacks of the disease by raising its health, strength, and power of resistance in accordance with the principles described in these pages. Acting in this manner, the research organizations will do a vast amount of good. Their recommendations will be listened to with respect.

They should not abandon the scientific study of the problem, but they should unceasingly recommend preventive action for a preventable disease, which is far better than operative treatment when that preventable disease has broken out. The latter is at present the only measure urged on the public, as the circular issued by the Leicester health authorities shows. Unfortunately, about 90 per cent. of the cancers are invisible, as will be seen by reference to the full table given in the beginning of the seventh chapter. As an invisible cancerous growth is apt to escape notice for a long time because it is painless, the surgeon is called in often only when it is too late. Prevention is better than cure, and it is ten times better than an operation which may not result in a cure. The research organizations are unfortunately searching only for a cure, disregarding the far more important aspects of prevention.

In relatively very few cases the spontaneous cure of apparently incurable cancers has been reported. Dr. Georgina Ludon wrote in the 13th volume, page 567, of the *Collected Papers of the Mayo Clinic,* in a contribution entitled "The Blood Cholesterol: its Importance and the Value of its Determination in Cancer Research":—

"Rohdenburg has published a detailed account of 302 cases in which this phenomenon occurred; in roughly one-third of these cases a microscopic diagnosis was made and the subsequent history 'carefully controlled.'

"In every instance, the condition of the patient had proved to be inoperable, 'hopeless.' No radium treatment had been given and such operations as had been performed are described as 'palliative' or 'incomplete.' Yet tumour and metastasis disappeared and the patients became 'clinically well.'

"The importance of this fact can hardly be over-estimated. It is proof positive that the human body can wage a winning fight against malignancy under the most untoward conditions. Since outside aid had proved useless, the victory must have been won by inside means. Changes in the body chemistry, resulting from increased or renewed activity of organs by which the chemical condition in the body is regulated, seem to be the only available explanation, since the chemical composition of the blood must influence the body cells."

There are a good many contradictory explanations relating to the spontaneous and apparently miraculous cure of cancer which seems to occur now and then in inoperable cases.

From a study of the literature bearing on the subject, it seems to me that the research organizations have not paid sufficient attention to the so-called spontaneous cure of the disease. In this direction far more might be done and the most careful enquiry seems more promising than experiments on the lower animals.

What Benevolent and other Associations Can Do

The great benevolent societies, charitable societies, life insurance societies, etc., have millions of members, and they are vitally interested in reducing the cancer death-rate. Their funds are being rapidly depleted by the unforeseen increase in the cancer death-rate. Besides, they are anxious to diminish the suffering among their members. They should realize that the harm done by alcohol is infinitely smaller than that done by vitamine starvation. Hence they should do all in their power to bring about the reforms required.

It is no doubt possible to bring down very greatly the number of cancer deaths by improving our methods of feeding and living which are responsible for the prevalence and the rapid spreading of the disease.

The associations mentioned should inform their members as to the dangers of chronic poisoning and vitamine starvation. Besides they should bring pressure to bear upon the local and national authorities and insist that the laws of health should be taught everywhere. They should oppose those fatal tendencies of the present time which are responsible for most of our chronic diseases, for most of the diseases of civilization, including cancer. They should open a great campaign for improving the health of the people, both for the sake of humanity and for the protection of their resources. The Red Cross Society should endeavour to organize a nation-

wide campaign in which all the voluntary organizations might take part.

There are a great many societies for fighting cancer and for studying cancer, but there are, as yet, no societies devoted to the prevention of cancer. Syphilis, consumption, drunkenness, insanity, are minor evils if compared with cancer. There are numerous societies aiming at the prevention of these minor plagues, but no society founded for the purpose of preventing the greatest plague of all. The absence of such a body is no doubt due to the fact that hitherto it was believed that cancer was not preventable, that it mysteriously appeared for some reason quite unknown.

To readers of this book it must be obvious that the cause of the disease is plain and that it can be prevented in the vast majority of cases. Therefore a cancer prevention society is urgently called for and it is to be hoped that some wealthy, public-spirited man will come forward, found such a society and endow it adequately. His name will live in history. He will have saved millions of people from unspeakable tortures. He will be mentioned in the annals of civilization together with Jenner, Lister, Pasteur and Ronald Ross.

What Local Authorities and the Government Can Do

The local authorities and the Government possess a great and powerful machinery for the preservation and the improvement of the health of the people.

An army of doctors is employed to supervise, to

observe, to inform and to direct the nation in health matters. Vast funds are spent every year for this excellent purpose.

Everything appertaining to the national health comes into their purview. They study, and endeavour to control, every disease and all the factors which may lead to disease or to the deterioration of the public health. They inspect the drains of our towns, the draining of our houses, the health of the children at school. They insist upon proper care of the eyes and the proper care of the teeth of the little scholars.

They endeavour to look after young mothers and their babies by providing certified midwives and nurses. They establish centres for the teaching of mother-craft. They provide poor mothers with milk, cod-liver oil, and whatever else they may need. They have established excellent clinics and sanatoria for consumptives. They endeavour to stamp out syphilis by both tuition and gratuitous treatment.

Their aim is obviously not only cure but also prevention. However, they have so far done nothing for the prevention of cancer because it was treated as a disease of which the causation was quite unknown.

I would urge upon all health authorities to study my analysis of cancer, and if they should come to the conclusion that cancer is indeed caused by chronic poisoning and by vitamine starvation it will be absolutely clear to them that the disease is preventable. They should then embark upon a campaign of prevention without delay.

The public is longing for the knowledge how to prevent cancer and it is entitled to demand that the health authorities everywhere should study my theory and should either pronounce it correct or incorrect. And if it should meet the test, and I think it will, then no moment should be lost in enlightening the nation. That is their duty.

Enlightenment alone will not suffice. Not only educative action is needed but legislative action is called for as well.

The civilized nations are suffering more severely from cancer than the uncivilized, and the disease is rapidly spreading because they live on devitalized food which is unfit for puppies. They suffer from progressive and ever-intensified vitamine starvation.

Pandering food-fakers and chemists combined are destroying millions who die in protracted agony. Pandering food-fakers and chemists combined are converting an originally healthy and strong race into a race of miserable, melancholy dyspeptics who are unable to stand fresh air, strong sun, cold water, natural food and natural exercise. They are creating a new race, a race of men and women whose system has been poisoned all along the alimentary canal from rotten teeth and gums sodden with pyorrhœa down to the anus ornamented with hemorrhoids and fistulas. They are producing a race of men and women whose putrefying tissues and organs have to be removed piecemeal by the surgeon so as to save the rest of the body from putrefaction and decay.

Civilized men have been reduced to such a condi-

tion by their wrong ways of living that medical men and surgeons have seriously advocated that in young children the appendix should in all cases be cut out for preventive reasons and that we had better have all our teeth removed and rely on false teeth so as to escape pyorrhœa and all the serious consequences which spring from festering gums.

It will not be an easy matter for the national and local health authorities to undertake an educative and legislative campaign for the prevention of cancer.

Their advocacy of the needed reforms will bring them into opposition with exceedingly powerful vested interests.

The food-manufacturers, the food-improvers, the food fakers, the providers of "thoroughly scientific foods" will all be up in arms and will oppose the return to plain natural foods containing all the vitamines. Instead they will offer us scientific foods rich in vitamines, vitamine extracts in bottles, in powders and in pills. They will offer us anything except the natural article, for their prosperity is obtained by depriving us of the natural article, denaturalizing and devitalizing it.

The wealthy producers of the innumerable tempting but highly dangerous foods are powerfully represented in all the local and national legislatures.

A campaign similar to the anti-slavery campaign may be needed in order to set the people free and enable them to obtain natural food which at present is almost unobtainable for the great majority.

The local and national health authorities are the

guardians of the public health. They must realize the seriousness of the position, the strength of the opposition which they are bound to meet, and they must be prepared for the fact that the vested interests will lavishly spend funds and engage scientists and writers for the defence of those powerful industries which pander to our appetites, our idleness and our short-sightedness, but which bring us disease, suffering, and death.

CHAPTER XIX

Conclusion

In the beginning of the first chapter I stated that, if the present death-rate from cancer should be maintained, 5,000,000 people now living in England and 10,000,000 people now living in the United States should die of that horrible disease. However, I expressed the opinion that the cancer death-rate was likely to advance with great rapidity in England and still more rapidly in the United States, and I estimated that the number of cancer victims in England might be increased up to 6,000,000, 7,000,000 or 8,000,000, while that in the United States might rise to anything from 15,000,000 to 20,000,000.

To the attentive reader of these pages it must be clear that the cancer death-rate is bound to increase very greatly indeed unless effective counter-measures, such as those described in the foregoing chapter, are adopted without delay. Nevertheless I think I ought to state clearly why I take such a serious view of the future.

I have shown in the course of this book in the fullest detail and by means of the most reliable scientific material available that cancer is due to chronic poisoning and to vitamine starvation. Un-

fortunately there is every reason to believe that chronic poisoning and vitamine starvation are rapidly increasing in the most advanced countries.

Chronic poisoning leading to cancer is due partly to auto-intoxication, to bowel poisons, which means to poisons which are formed largely in consequence of the consumption of foodstuffs which have been deprived both of the vitamines contained in them and of the rougher material, such as the husks of grain, the skin of fruit and the coarser vegetable fibre. Partly is it due to the continued absorption of chemical poisons, among which poisonous preservatives are most important.

Chronic poisoning and vitamine starvation go hand in hand. Both are alarmingly increasing and both are likely to be increased still further in the near future.

It is becoming more and more difficult for people, especially in the towns, to obtain natural food in its natural condition. Powerful interests have instituted a veritable food blockade against the community. That blockade is being tightened to an ever-increasing degree. The strangle-hold obtained by them is becoming ever more deadly.

Great organizations buy up the bulk of the natural food supply. They deprive the foods obtained of their vitamines and sell them to middlemen and retailers. These spoil the foodstuffs still further and then hand them on to the unfortunate public, which has no choice, which can only buy what is offered in the shops, practically all of which sell nowadays the identical denaturalized and doped foodstuffs.

An example or two will make my meaning abundantly clear to my readers.

The milling interest buys up all the wheat, grinds off all the outside and hands over the dead, vitamineless flour to the wholesalers. These very often bleach it and add to it various chemicals which are supposed to facilitate baking, to improve the appearance of the loaf or to make a bigger loaf, to the great injury of the community, which is forced to buy a deceptive article which is attractive to the eye but which is made unwholesome and dangerous to health by the various manipulations it has undergone and by the various chemical ingredients which have been added to it.

Some of the flour reaches us in the form of bread which causes disease and rapid death to animals which are fed exclusively on that bread and water, whereas similar animals fed on wholemeal bread and water will flourish. This has been shown in the chapters dealing with vitamine starvation.

Some of the flour is converted into cakes and pastries by bakers who add to the impoverished flour sugar deprived of its vitamines or saccharine, a derivative of coal-tar. They further add milk which is frequently deprived of its cream, but which is fortified with chemicals and dried or liquid eggs, which likewise have had chemical poisons added to them. Attractive flavourings, many of which are extracted from coal tar, make these productions pleasant to the sense of smell, and aniline dyes make them pleasing to our eyes. These are the "goodies" on which children are largely fed.

Milk, the food of infants and of invalids, is similarly treated. Large organizations buy up the supply, take off part of the butter fat, heat and reheat the milk, destroying thereby its value, and hand it on to the distributors who deliver it to the consumers. In the homes of the people, the denaturalized liquid, which looks like milk but which has lost its true value, is heated or boiled once more or oftener than once. It is no longer a food fit for infants or invalids, especially as it is very frequently mixed with poisonous chemicals, as has been shown in Chapter XI.

A large portion of the milk produced is bought by powerful organizations. These dry it and sell it to us as milk powder under various fancy names or sell it to us in tins. Some milk is converted into various baby foods, invalid foods, etc. The unsatisfactory character of heated and dried milk has been pointed out by eminent experts quoted in this book.

Other essential foodstuffs are treated, or rather spoiled, in a similar manner. Thus the people are given a selection of foods on which the lower animals would starve. The vitamines of which these foodstuffs have been deprived are given to pigs and cattle or are thrown away, and these invaluable substances are replaced by poisonous preservatives.

In the United States cold storage has been developed to a far greater extent than in England. When I was in that country I was given meat, poultry, eggs, butter, etc., which I was assured were several years old. The cold-storage system is spreading rapidly everywhere, which means that vi-

tamine starvation is becoming ever more intensified. Only the very rich who have farms and bakehouses of their own can be sure of obtaining pure, undevitalized, unadulterated and unpoisoned food. The great majority is forced to live on devitalized, doped, embalmed and mummified food.

The disaster of our nutrition is increased by the improvement of the cooking appliances, by the cheapness of fuel and by the emancipation of the women.

The improvement of the cooking appliances and the cheapness of fuel have brought about a veritable cooking mania. In millions of households everything consumed is cooked "to kill the germs." Unfortunately the process kills not only the harmful germs but also the beneficial bacteria and the vitamines. Thus the process of denaturalizing the food we eat is made complete.

The emancipation of women has led to a widespread unwillingness to do the domestic cooking, an unwillingness which threatens to become universal. Consequently we have to rely to an ever-increasing extent on "scientifically prepared" foods, or "ready to eat" foods, or dried, bottled and tinned foods and other factory-made foods which require no cooking. These "scientifically prepared" foods may be pleasant to our senses, clean and carefully sterilized, but they are almost invariably deprived of the vitamines, and they are very frequently heavily charged with poisonous preservatives, dyes, etc., to improve their appearance and keeping qualities.

We cannot wonder that ever-intensified vitamine

starvation and ever-increasing chronic poisoning, due to the incessant absorption of noxious chemicals added to the food and the chronic absorption of bowel poisons, are undermining the national health.

The position is becoming more and more serious. The chronic poisoning of the nation is apparent from the general increase of indigestion and of constipation and from the rapid increase in the sale of remedies designed to cure those evils.

The increasing seriousness of the mischief is shown furthermore by the rapid progress of degeneration which affects the alimentary canal of civilized nations and by the equally rapid increase of diseases consequent upon chronic poisoning and vitamine starvation, among them cancer.

The digestion of the people has become so bad that everywhere we are offered pre-digested foods, food medicines and medicated foods. The chemist has turned grocer and the grocer has turned chemist.

We are offered tonic drinks, containing quinine and other dangerous stimulants, health drinks and health foods, containing various aperients, or aperients and tonics combined, digestive biscuits and other foods and drinks containing pepsin, pancreatin, diastase and other digestive remedies, "highly scientific" protein foods, albumen foods, etc. Frequently chemical analyses of these so-called foods are printed on the wrapper.

The only thing which we are never offered by the advertisements which meet the eye everywhere, which fill the newspaper and the hoardings, is natural food in its natural unspoilt condition.

For a great many years the cancer mortality was much higher in England than in the United States. In the United States the cancer death-rate was relatively low because many millions of people in the country led a natural life and lived on natural food.

The cancer mortality has been rapidly increasing both in England and in the United States, but it has advanced far more quickly in the United States than in England. This is only natural, because great American combines have monopolized and devitalized the food supply. Besides, tinned foods and cold-storage foods are being consumed perhaps more freely in the Republic than in England. Furthermore, the Americans are great consumers of sugar and they do not take much exercise. Hence stout people are far more numerous in the United States than in England, and stoutness and cancer go often together, as has been shown in the first chapter of this book.

The cancer death-rate in the United States is likely to advance more rapidly than in England, not only for the reasons given but also because of the emancipation of the American women, because of the scarcity of servants, because of National Prohibition and because of the universality of the motor-car.

American families often live entirely on food bought ready to eat, on factory-prepared food, on vitamineless and chemically doped food.

Although America produces boundless quantities of meat, fruit, vegetables, etc., the natural article is consumed less and less by the people. The vast increase of the national wealth has led to a corre-

sponding increase in the consumption of the more refined foods which favour constipation and auto-intoxication.

People who have been deprived of alcohol turn to sugar, the dangerous qualities of which have been explained in the thirteenth chapter of this book. The advent of Prohibition has led to an enormous increase in the sugar consumption. It may be that ten times as many people may die in the United States from sugar poisoning as died from alcoholic poisoning before 1917.

The universality of the motor-car has abolished physical exercise on the part of millions. Walking has become impossible on the motor-crowded roads. In consequence of this, auto-intoxication, which leads to cancer, is bound to increase very greatly among the completely sedentary people.

The vitality of the people is still further lowered because the air of the towns is becoming utterly vitiated by petrol fumes. This is all the more dangerous as petrol fumes may conceivably act as a cumulative poison.

For the reasons given we may expect that the cancer mortality is bound to increase very greatly both in England and in the United States, and particularly in the latter country.

Mr. Lothrop Stoddard in a most interesting book entitled *The Rising Tide of Colour* has pointed out the danger which threatens the civilized nations from a possible rising of the coloured races. A far greater danger threatens them from cancer. Chronic poisoning and vitamine starvation combined may

increase the cancer death-rate to an unbelievable extent and may destroy the predominance of the white race.

Strangely enough, men get indignant and excited when they read of isolated cases of acute food poisoning, such as poisoning by arsenic or by botulism, which claim only a few victims here and there. But they pay no attention whatever to the fact that hundreds of thousands die every year in torments in consequence of chronic food poisoning, called cancer.

Prevention is better than cure. The search for a cure for cancer has proved futile and may continue to prove futile.

Neither science nor wealth nor medical skill can protect us against this dreadful scourge, and the surgeon comes, as a rule, too late.

Medical science has invented wonderful appliances by means of which doctors can look deep down into the throat, into the stomach, into the bladder, deep into the bowel, into the uterus, etc., all of which locations are favourite cancer sites. By means of X-rays, doctors can inspect and study the insides of men and women.

Yet all these wonderful appliances are no real protection against cancer.

If the wealthiest man had himself X-rayed every week by the ablest scientists and had his inside inspected every week by means of the apparatus mentioned, by the ablest doctors, they might, as I am assured on the highest authority, fail to detect cancer until it was too late. In women the difficulty of discovering cancer is as great.

I am assured by perhaps the highest authority on blood that there is no reliable blood test by means of which the presence of cancer can be ascertained.

The position is most serious. Science and wealth are helpless against cancer. Prevention only can stave off the danger. As Sir Arbuthnot Lane stated in his introduction to this book, "By no means known can we *cure* any chronic disease."

Medical science can fight against malaria, syphilis, rheumatic gout, heart disease and arterio-sclerosis, etc., but it cannot make men whole who suffer from any of these diseases and of a great many others.

Malaria can be fought successfully only by prevention, by destroying the cause, the mosquito bearing it. Syphilis can be fought only by prevention, by avoiding infection. Cancer can be fought only by preventing its occurrence.

It is a crime to allow people to be attacked by preventible diseases and then to try and effect a more or less unsatisfactory and necessarily only partial cure.

A man who has been attacked by a chronic disease may be mended, to some extent, by his doctor and by Nature acting in common, but he will always remain a patched and a broken man. There is at present no cure for cancer and there may never be a cure. As cancer is due to wrong living, the only true remedy for the disease is right living.

The prevention of cancer is not merely a question of life or death to millions of people now living. It means a great deal more. Death has no terror for men and women of commonsense. Death, after all,

is inevitable. We all must die, but we need not be tortured to death. The cancer question is not merely a question of life or death. It is a question of life or unspeakable and unnecessary agony protracted for months and months.

By the reforms indicated in the previous chapter the cancer death-rate might be greatly reduced and, in course of time, that terrible disease might be almost eliminated. It might become as rare as leprosy, which in the Middle Ages was general throughout Europe. Moreover, the reforms proposed would not merely abolish cancer. They would reduce, or abolish, a great many other diseases of civilization which likewise spring from chronic poisoning and vitamine starvation. The health of the people and their happiness would be greatly increased. The death-rate would decline very rapidly. The haunting spectre of cancer would be laid.

POSTSCRIPTUM

In various chapters of this book I drew attention to the fact that one was justified in believing that certain chemicals which are as yet not known to be cancer producers might reasonably be suspected of causing that disease. Among these chemicals was creosote, and I drew the attention of my readers to the danger of using it. Two weeks after the manuscript had been sent to the printers, the *British Medical Journal* of the 1st March printed an article "Epithelioma of the Skin after Prolonged Exposure to Creosote," written by Dr. H. A. Cookson, Pathologist to the Royal Infirmary, Sunderland. The article stated:—

"The following case is an example of occupational cancer. It is an instance of epithelioma of the skin of the right hand in a worker exposed for many years to creosote. It will be noted that he had also a few warty growths on the left arm, one of which presented evidence pointing to possible early malignant changes.

"The patient, who was 66 years of age at the time of his death, had worked for 33 years in a creosote factory; his work was to carry wood after creosoting, and he stated that he was 'up to the eyes in creosote.' A good many years ago (certainly 15) a small swelling appeared at the back of his right hand, 'like a corn.' Every now

and then it cracked open and healed up again. Eight years ago the growth had increased to the size of a two-shilling piece; subsequently it gradually spread until, just before operation, it was a large fungating ulcer covering the dorsum of the hand.

"A portion of the edge of the ulcer, removed and examined histologically, previous to amputation, proved to be a squamous epithelioma.

"A circular amputation above the elbow was performed by Mr. S. Raw, surgeon to Sunderland Royal Infirmary, to whom, and to Dr. Gilbertson of Sunderland, I am indebted for the clinical history. Seven or eight weeks later the patient died suddenly and a post-mortem examination was made.

"There were a few small warts on the left forearm. Beyond changes common to his age, the organs were healthy, save that there were small secondary epitheliomatous deposits in both lungs, in the liver, and in both kidneys. There were also two secondary deposits in the heart walls—one the size of a walnut in the left ventricular wall, involving its whole thickness and beginning to break down in the interior, and the other, the size of a pea, at the right border of the right ventricle.

"The case is put on record because it appears fairly certain that creosote was the cause of the malignant growth and subsequent death of the worker. It will be noted that the internal organs showed numerous secondary deposits of cancer. The large deposit involving the wall of the heart projected into its interior. The glands in the right armpit were enlarged and invaded by malignant disease. The amputation wound was in excellent condition."

The account given confirms my views as to cancer being due to chronic poisoning extending over a long period of time. The patient, it will be noted, had been handling creosote for 33 years. There are prob-

ably a good many other chemical poisons which act as cancer producers and which will become known to be cancer producers in due course.

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